THE VETERINARY JOURNAL

A Monthly Review of Veterinary Science.

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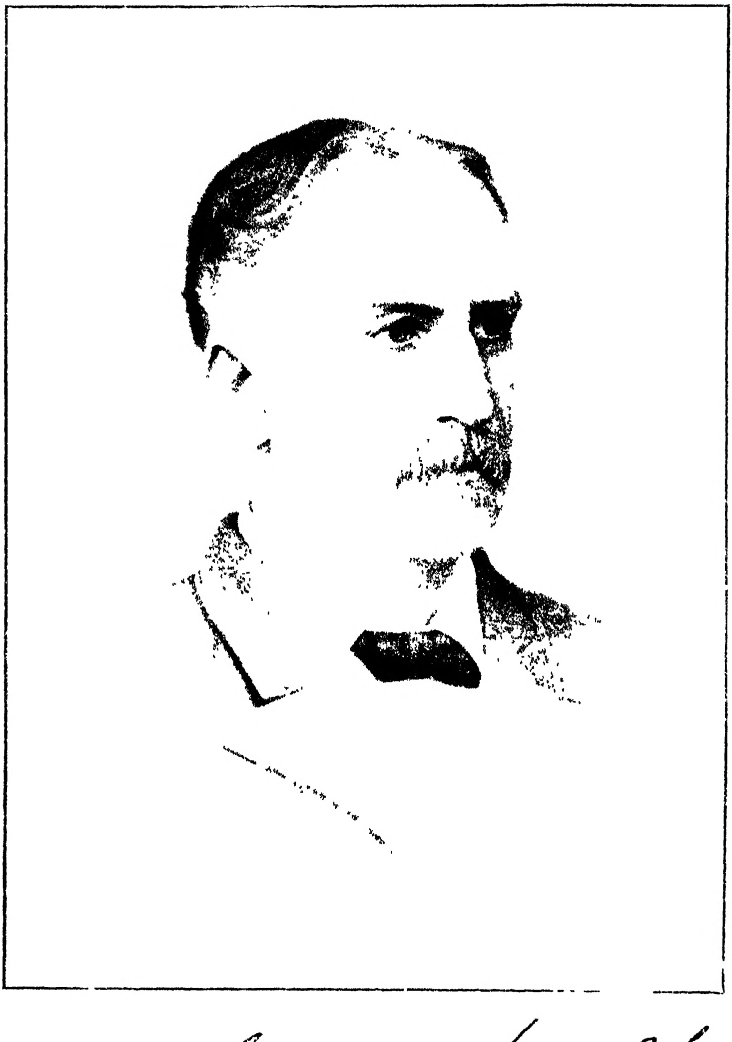


Yours faithfully
L Morley Case

THE

VETERINARY JOURNAL

JANUARY, 1910.

THE LATE PROFESSOR J. W. AXE, M.R.C.V.S.

THOSE of our readers who knew Professor John Wortley Axe will be very sorry indeed to hear of his death, which took place at Winthorpe Lodge, near Newark, Notts, on Wednesday, December 15, 1909. Professor Axe had been in very ill-health for several years, and had in consequence been compelled to give up active professional work, so that many of us were not surprised although the end was sudden.

John Wortley Axe took his diploma at the Royal Veterinary College, London, in 1866, and was appointed to the teaching staff of his *Alma Mater* in 1869. He was very highly appreciated as a teacher, and soon won the affectionate regard of his students, who, after qualifying, frequently took advantage of his knowledge, skill, and tact for consultations. He was a good surgeon and fearless operator, and in the realms of medicine did excellent work in connection with anthrax, and abortion in cows. He discovered a small strongyle in the stomach-wall of the horse, and the parasite is now known as *Strongylus Axei*. Professor Axe resigned his professorial chair in 1893 and devoted himself principally to consultations, in which connection he was in great demand until his health failed. One of his latest contributions was a paper on Anthrax presented to the National Veterinary Association Meeting at Windermere in 1903. He was Veterinary Consultant to, and Member of, the Council of the British Dairy Farmers' Association; and for many years a member of the Council of the Royal College of Veterinary Surgeons, of which body he was President for the year 1889-90.

Editorials.

THE TREATMENT OF RED WATER IN CATTLE.

ELSEWHERE in this issue of the VETERINARY JOURNAL we reprint an abstract of a very instructive series of experiments carried out by Professor Nuttall, of Cambridge, and Dr. Hadwen, of the Canadian Department of Agriculture, on the treatment of piroplasmosis of cattle with a dyestuff known as trypanblua. These workers some little time ago used this agent, and proved its usefulness for piroplasmosis of dogs. Their conclusions have been confirmed by Jowett, working independently in South Africa, an account of whose work we published in our last month's issue. The success met with in dogs has led the primary investigators to go further and apply similar measures to cattle affected with piroplasmosis, and the results are certainly encouraging. The common disease due to this class of parasites in Great Britain and America is red water, so we specially desire to draw the attention of country practitioners to this line of treatment, which, at any rate, is based on a good experimental footing. Up to this, the curative treatment of red water has been truly empirical, and it now looks as though we are about to adopt rational measures. One important fact, however, must be borne in mind, and the client must be prepared for it, namely, the temporary pigmentation of the tissues.

We trust that practitioners will take up this line of treatment during the coming season, and that they will carefully note the results obtained and record them, so that others less favourably placed for satisfactorily testing its efficacy may reap the benefit of their experience. Should this method prove a success, the veterinary profession and agriculturists in general will owe a debt of gratitude to Professor Nuttall and his co-worker.

"VIS UNITA FORTIOR."

One of the most stirring topics agitating the veterinary profession in the United Kingdom at the present time is the suggested union of veterinary societies. The motto of the Royal College of Veterinary Surgeons—"Vis Unita Fortior"—provides the all-important reason for the accomplishment of some such union or amalgamation. With an united veterinary profession much that is desirable could be accomplished that is now impossible. One draft scheme has been put forward and discussed by several societies. Like all draft schemes, it does not pretend to be perfect. It can be improved in many ways, no doubt, but it forms an excellent working basis on which to proceed. Before various societies can agree to amalgamate they must see what advantages are likely to result from the union. The objects set out in the proposed scheme give a fair idea of what might be accomplished, given proper facilities, such as the support of claims of the profession to legitimate veterinary appointments, the defence of members involved in unfair prosecutions arising from practice, the arrangement for bacteriological examinations and analyses on favourable terms, and the establishment and administration of a benevolent fund, to mention just a few.

A National Society—national in fact as well as in name, and really representing the profession—would have an undoubted beneficial influence. All the objects of the proposed society are well worthy of support. To have two benevolent funds is a mistake, and a really strong defence fund would be more powerful in taking up cases. One efficient organization could deal better and more effectively with these matters. If the profession really desires to combine in an effective force which would have influence on public opinion and on Government bodies, amalgamation is the only way to do it. The parent body then might have geographical divisions, as England and Wales (North), England and Wales (South), Ireland, and Scotland. One advantage of this would be found in dealing with public bodies, such as, for instance, the Local Government Board for Ireland, for a branch representing the whole of Ireland, and backed up by the whole profession in the United Kingdom, would have much more influence than any individual society.

But all these advantages cannot be obtained without funds, and it is obvious that the present funds of local societies would not permit of large subscriptions from them to the proposed parent body. The only way out of the difficulty, and a very simple way, would be to increase the amount of the annual subscription by the amount required to finance the parent body. No individual should mind that, for his extra subscription would entitle him to advantages and privileges far outreaching what he could get in any other way. We think well of the principle, and hope a workable scheme will be evolved from the one now being discussed.

1910.

THE VETERINARY JOURNAL takes this opportunity of wishing all its readers throughout the world success and prosperity during the coming year.

EDITORIAL CHANGE.

WE are pleased to announce that Professor Gilruth, Principal of the Veterinary College of the University of Melbourne, has consented to join the Editorial Staff of the VETERINARY JOURNAL. We welcome him very heartily, and we are sure that he will prove a great acquisition. His enthusiasm and practical experience will substantially assist in maintaining, and possibly improving, the high standard of efficiency for which we have laboured in the past. We may also direct the attention of our Colonial readers to the fact that this journal may be obtained throughout Australasia through the agency of Messrs. Gordon and Gotch.

General Articles.

THE PREVENTION OF STRANGLES.[1]

BY GENERAL SMITH, D.S.O.
Director-General of the Army Veterinary Service.

THE inefficiency and financial loss resulting from strangles cannot be too frequently impressed, and it is often a matter of surprise to hear this disease so lightly spoken of. As a matter of fact, there is no affection of army horses which can compare with it either in the prolonged inefficiency it produces, or in such far-reaching disastrous results. Not only is strangles responsible for a large amount of sickness among young horses, but with these it is the chief cause of pneumonia, pleurisy, and subsequently of "roaring."

Strangles is a highly infectious disease due to a micro-organism. It usually shows itself by means of abscesses in the region of the throat, but these are only the local manifestations of a disorder which exists throughout the system, accompanied by fever and wasting. Many horses suffer from it unrecognized, owing to the fact that no abscess forms externally; but many of the cases of so-called influenza, epizootic fever, or catarrhal fever, are nothing less than strangles without the external manifestation of an abscess. The nasal discharge of such cases frequently contains an organism which cannot be distinguished from that of strangles.

For some time past this Department has been endeavouring to protect horses against strangles by means of a vaccine or by inoculation to so weaken the attack as to modify the course of the disease. The results which have been obtained in the matter of "protection" are far from complete, but the great importance of the subject warrants the information which has been obtained being placed on record.

It is well known that the class of organism to which strangles belongs may, by suitable methods, be made to furnish a serum, which, when inoculated into a susceptible animal, confers a temporary protection against the disease. Working on these lines, various protective strangles sera have been produced, of which three have been submitted to experimental test during the past year. These are known in this report as A, B, and C.

The immunity conferred by a serum is only temporary, but it can be made to last one or two months; the time thus gained is invalu-

[1] From the Annual Report for 1908.

able, for strangles is only maintained in the army by the regular introduction of the disease by means of remounts, which in turn contract it in dealers' stables. If our remounts can be protected immediately they are bought, strangles should be capable of control. The first effort in the direction of protection was to ascertain whether any of the three mentioned sera would afford temporary immunity. The only method by which this could be determined was to take a batch of remounts, inoculate half with serum, and use the other half as controls. This was done in the following case:—

SERUM A.

Remounts inoculated	32
Subsequently affected with strangles twelve days later	1
" " " four months later	1
Remained healthy	30

CONTROLS.

Total number of remounts not inoculated	48
Subsequently contracted strangles	9

In the above observations it seems clear the serum was of use. The whole of the remounts formed one batch, and the chances of infection were equal. The horse which contracted the disease twelve days later was probably affected at the time of inoculation. The one which developed it four months after inoculation demonstrates that the immunity does not last that length of time; but one or two months' immunity are worth paying for, as in this way the disease could be practically excluded from the Service.

Serum B tested as above proved useless.

SERUM C.

Remounts inoculated	39
Subsequently contracted strangles	2
Remained healthy	37

CONTROLS.

Total number of remounts not inoculated	44
Subsequently contracted strangles	6
Escaped infection	38

Of the thirty-eight which escaped infection, a very large number subsequently suffered from catarrh; in fact, out of the whole batch of forty-four, only seven remained free from trouble of any kind, whereas in the inoculated batch of thirty-nine, twenty horses remained free from any form of catarrh.

The most severe test to which an animal protected with serum can be subjected is to expose it to infection; if protected, no ill-effect

arises, or if the protection is only partial the disease runs a mild course, and permanent immunity results.

Nine horses previously protected with Serum C were exposed to strangles infection under conditions which would have led to infection had they been susceptible. Of the nine, three had a rise of temperature on fifth, ninth, and thirteenth day after exposure, followed by catarrh and thickening of the glands of the throat, but at no time did any external abscess occur. Six of the nine were completely unaffected.

It may fairly be assumed that the previous protection with serum was the explanation of these encouraging results, but beyond that assumption we are not entitled at present to go until many more observations have been made. The only definite statement that can be made is that the results are encouraging and hopeful for the future.

The influence of serum in the treatment of cases of the disease is not encouraging. Serum A appeared to modify the course of the disease and the character of the discharge from the abscess, but both Sera B and C were without any action in this respect.[1]

Serum B was extensively used in catarrhal fever and pneumonia. The results obtained were very conflicting; occasionally its beneficial effect was marked, but frequently no result was observable.

These remarks on strangles were prefaced by a statement that the disease, in spite of its ravages, is not taken seriously. The spread of strangles through a batch of remounts is indicative of want of appreciation of its extreme infectiousness. The infectiousness cannot be assigned an exact expression, but it is so high that perhaps no horse can escape it that has not passed through an attack of the disease. This indicates the great care which should be taken in the isolation of remounts, and the further isolation of those showing signs of catarrh. It may be argued that insufficient stable accommodation exists to admit of anything but a very limited isolation. This is so, but there is always the barrack square available for seasoned horses, the remounts being accommodated in their stables.

The daily disinfection of mangers, walls, fittings, and flooring of stalls occupied by remounts during the strangles period is a tedious process, necessitating a small permanent staff for the purpose, but repays the trouble a hundredfold by the security it affords.

[1] Since this was written, it has been proved that animals treated with a special serum while the disease was in the process of incubation were not benefited, nor the violence of the attack in any way modified. Some improved method of employing serum with the sick is being looked for, but experience will, no doubt, show that the important point is to inoculate before the horses are exposed to infection.

The virus is readily destroyed by efficient disinfection with the spraying machines now available, which give great penetration and search out all cracks, crannies, and crevices, where microbes can lodge, while all brickwork, ironwork, mangers, bails, &c., are immediately sterilized by the disinfecting lamp. Nothing, in short, is required to keep an outbreak of strangles within moderate proportions but vigilance, thoroughness, and common-sense.

OCHRONOSIS OR MELANOSIS OF THE SKELETON OF THE PIG.

By Professor A. E. METTAM, B.Sc., M.R.C.V.S., &c.
Principal of the Royal Veterinary College of Ireland, Dublin.

It is a well-known fact, known since the days of John Hunter's experiments with madder, that the bones may become pigmented, that in young bones colouring madders may be deposited in the matrix of the bones. Advantage was taken of this peculiarity to observe how bones grew, and when the madder was withheld from the diet a ring of new bone developed, free from colouring matter. In this way, in a long bone for instance, concentric rings of coloured and non-coloured bone formed corresponding to the periods when madder was given and when withheld.

I understand that it is not rare to find pigs in the large curing houses in Ireland which have pigmented bones, but I never came across a case until the present one, for which I am indebted to Mr. J. A. Jordan, M.R.C.V.S., Veterinary Inspector, Belfast. The specimen included portions of the chest-wall, sternum, four dorsal vertebræ, and the portion of the right innominate bone, femur, patella, tibia and fibula of the same limb. I am informed that all the bones of the skeleton showed the same condition. The animal was apparently in good condition, and had been purchased for curing purposes. It was of the white breed, but any further information I am unable to obtain. The bones were dark mahogany brown to black in colour, but otherwise normal. The cartilages were *not* coloured. The red marrow of the ribs and sternum when squeezed out of the bones was as if mixed with ink or blacking, the "yellow" marrow of the shaft of the long bones was greyish in colour. A single lymphatic gland found in the position of the prepectoral lymphatic glands was dark brown or blackish. The colour extended into the cortex of the gland, but to the naked eye the medulla was free. No pigmentation was observed elsewhere, and the intima of such portions of the vessels as

were left was also free from pigmentation. No pigmentation of intermuscular fascia or other parts was found.

In man there is a condition known as ochronosis, first observed in 1866 by Virchow accidentally at the *post-mortem* examination of an old man. It is manifested by pigmentation of the cartilages, which are of a brownish or blackish hue. Cohnheim, in his lectures, referred to the case, and mentioned that, in addition to the cartilages and intervertebral discs being pigmented, there was also discoloration of the intima of arteries and of the synovial membranes. The colour appears to have been due to an evenly diffused saturation of the matrix of the tissue with pigment. According to Thoma, Virchow and Böstrom have described two cases of pigmentation of all the cartilages of the body, which was caused by a granular black-brown pigment, which was partly in solution and partly present in granules. Diseased portions of the endocardium, and of the arteries, where there was thickening by connective tissue showed the same colour. The pigmentation is said to have been due to absorption of disintegrated blood pigment, but no explanation is offered as to why other tissues escaped. Nor is there any description of the condition of the organs, as for instance the kidneys.

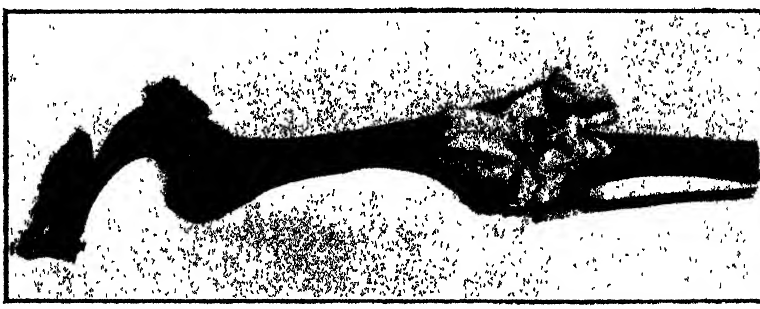
In 1904 Professor Osler recorded two cases of ochronosis occurring in brothers. The cartilages of the ears were involved, and the sclerotics were stained of a brownish-black colour. In one there was a butterfly-like patch of ebony-black pigmentation of the skin of the nose and cheeks. A chronic arthritis was a complication. These two cases with that of Virchow are included in the nine cases recorded in medical literature.

The cause of the condition is unknown. Virchow believed it was due to permeation of the cartilages by the derivatives of hæmatin, but that is probably incorrect, as Hanseman noticed that melanuria was present along with the lesion. Hecker and Wolf concluded after studying the urine that the colour was due to melanin. Albrecht found in the urine homogentisic acid, and suggested a connection between ochronosis and alkaptonuria. (Alkaptonuria is characterized by the tendency of the urine to darken on exposure to the air due to the presence in it of two acids—homogentisic and uroleucic acids. It is of rare occurrence, persists throughout life, and has apparently little effect upon the general health.)

Pick considers that ochronosis is a definite form of melanotic pigmentation, and that it is due to the same cause as melanosis or melanin formation generally—to the action of an enzyme, tyrosinase

upon a constituent of the protein molecule. Generally the pigment formed is converted into a colourless product which is excreted, but when for some reason this does not occur it produces pigmentation of the parts where it is retained.

In the specimen under discussion I examined the red marrow, films and sections, also sections of the heads of the ribs and transverse sections of the ribs. The red marrow films, stained by Leishman and Jenner's stains, and also by hæmatoxylin and eosin, showed the usual constituents of the red marrow, but in addition larger cells filled with pigmented granules—chromatophores. The cells were nucleated, contained one or more nuclei, the nucleus or nuclei being of the vesicular kind, but generally shrunken and collapsed. It was somewhat of the same kind as the nucleus of a hyaline cell. In the



Skeleton of hind limb of pig, showing the dark pigmentation of bones, except where covered with cartilage.

protoplasm of the cell were numerous granules of different sizes, coccus-like, of a brownish colour, the colour varying in intensity. The pigment-bearing cells were numerous in the films, in the sections of red marrow, and in the sections of bone including also red marrow. In addition to the cells containing pigment numerous free particles of pigment were present, some of which doubtless had been liberated from ruptured chromatophores. The chromatophores measured from 21·6 to 44 μ in diameter.

In the sections of heads of the ribs calcification was proceeding normally, and there was nothing abnormal in the articular cartilages nor any indication of deposition of pigment. The spaces in the cancellated bone contained red marrow, which showed numerous chromatophores. These chromatophores were distributed evenly throughout the marrow, and some placed close to the plates of cancellated bone. They have nothing to do with nor any connection with the myeloplaxes.

In sections of the bone I was surprised to find little or no evidence of deposition of pigment. True, under the periosteum there were fine granules in the matrix, and here and there through the section minute pigment particles, but nothing to account for the intense colouration of the bone in mass. In the contents of the Haversian canals chromatophores were present; in one canal, for instance, three could be made out filled with minute particles of pigment. Similarly also the canaliculi of some of the bone lacunæ, containing bone corpuscles, were rendered clear and unmistakable by pigment, which acted as an injection mass in the minute tubules, and here and there a bone corpuscle showed pigment. Nevertheless, microscopic evidence of the presence of pigment was difficult to find, and what I have described above was found because it was diligently sought for. I am compelled to conclude that the pigment was in solution, and that the colour of the bones was due to a soaking with pigment-containing fluid. The bones when placed in formalin and other preservative solutions gave up a considerable quantity of pigment, showing that the pigment is not so firmly fixed as in melanotic fibromata, for instance, and the absence or practical absence of granules in microscopic sections of the bones shows that the bones are stained with the pigment much in the same way as a section of bone or cartilage is stained by eosin or other protoplasmic stain.

Examination of the lymphatic gland showed that in the cortex were a number of cells containing granules of pigment. These granules were apparently entering into solution, because cells filled with granules, others with few, and others again free from granules, all of the same kind, were readily found. The cells are evidently the so-called hyaline cells with abundance of protoplasm around the nucleus. The pigment had stained the reticular network of the gland, and it appears as if impregnated with a fine granular pigment or a precipitate. It is not a precipitate, however, since the colour or the granules is present nowhere save in the delicate recticulum. The only explanation of the appearances observed is that the large chromatophores reach the lymphatic gland, and there the pigment is discharged or enters into solution and dyes the reticular connective tissue with which it comes in contact. The pigmentation is particularly well seen in the lymph channels of the cortex and medulla, and does not appear so markedly in the germinal centres of the gland. It is probable that the colour is in solution in the lymph, and as such is carried into the blood to be excreted. In the gland there are numerous eosinophilous cells, many more than under ordinary conditions, and their presence in great

numbers is itself suggestive, as they are probably evidence of positive chemiotaxis.

The absence of pigmentation elsewhere in the body may indicate that in the red marrow the pigment is converted into a colourless substance, and as such excreted. This is mere speculation, but there is some support for this belief in the character of the chromatophores and the contained pigment; it is not so deeply coloured, it is not so "fast" or fixed as in other melanotic lesions, and a larger amount than usual is soluble in water.

So far as I am aware, the condition has not been noted in veterinary literature, and I regret that more tissues and organs were not available for examination. It would have been of great interest to have examined the blood and the urine to note any changes and to see if this case could be brought into line with those observed in human medicine. Lastly, is it correct to describe it as ochronosis in view of the distribution of the pigmentation in man, or should we be content to call it melanosis? Because of the close relationship between cartilage and bone, and from usage, I incline to the first term, though, when all is said and done, it matters little which term we use, as the first signifies the colour is yellow, the latter dark brown or black, and the cause of both is probably the same.

NOTES CONCERNING *TRYPANOSOMA DIMORPHON.*

With a Few Preliminary Observations on the Trypanosomiases of Southern Rhodesia.

By L. E. W. BEVAN, M.R.C.V.S.

Government Veterinary Bacteriologist, Southern Rhodesia.

In 1902, when engaged in the Trypanosomiasis Expedition of the Liverpool School of Tropical Medicine, two distinguished investigators, J. Everett Dutton and John L. Todd, encountered in the blood of horses a pathogenic trypanosome which they described under the style of "the Gambian Horse Trypanosome." These observers distinguished three forms of the parasite, namely: (1) A slender long form; (2) a short "tadpole" form; (3) a "stumpy" form. Subsequent investigators, however, in studying the parasite have distinguished only the two latter forms, and the parasite has thus become known under the name of *T. dimorphon.*

Recently, in working with the strain of the parasite brought back from Africa by Dutton and Todd, various observers—viz., Thomas,

Breinl, Laveran, and Mesnil—have failed to see the long forms with thin body and free flagellum originally described, and it is suggested that Dutton and Todd were dealing with a mixed infection, one of which has died out. Bruce therefore suggests that, in the event of the name *T. dimorphon* being dropped as a misnomer, the compliment should be paid to Dr. Todd by naming the parasite after him.

Within recent years quite a considerable number of observers have met with the *T. dimorphon*, not only in equines, but in other domestic animals. Indeed, Dutton and Todd themselves, with Kinghorn, in their report of 1907 on the cattle trypanosomiases of the Congo Free State, mentioned that trypanosomes which they believed to be *dimorphon* were found in cattle of nearly every herd examined.

In 1904 Major F. Smith discovered a trypanosome (about 13 μ long) in a blood film taken from an ox which died in Sierra Leone. Nabarro thinks this may have been the small form of *T. dimorphon.*

Martin, in 1905, studied the trypanosomiases of the Lower Guinea, the mountainous districts of Fonta Djalon, and of Lubé, and along the banks of the Niger. He found that the horse, ass, ox, sheep, goat, pig, and dog were liable to infection. "Nearly all the trypanosomes had common characters, and appeared to belong to the type *dimorphon.*"

Martin hazards the suggestion that a wide belt of the African Continent, parallel with the Equator and extending from Gambia and Guinea on the West to the Anglo-Egyptian Sudan and Uganda on the East, is infected with *T. dimorphon.*

On March 25, 1909, at a meeting of the Rhodesian Scientific Association, a paper compiled by Montgomery, of the Liverpool School of Tropical Medicine, was read, and contained the announcement that he and Kinghorn had found the *T. dimorphon* widely spread in Northern Rhodesia between Broken Hill and Tanganyika, and had obtained specimens from the Katanga district of the Congo.

As is well known, *T. gambiense* of man is travelling in a southerly direction into Rhodesia, which was previously uninfected. The question that arises is, is *T. dimorphon* following a similar course? We have this evidence, that previous to 1907 *T. dimorphon* had not been seen in Rhodesia, that prior to 1908 no trypanosomiasis of any nature had occurred in the regions of Portuguese East Africa which are now infected with *dimorphon*, and that the area of Zululand in which Bruce carried on his classical work and met *T. brucei* alone is now naturally invaded with *T. dimorphon.*

One could not be criticized severely for interpreting this as a southerly extension of the organism first found in the Gambia. Shortly after Montgomery's declaration certain blood smears taken from cattle in the Hartley district of Southern Rhodesia were sent to Theiler, who found in them *T. dimorphon.*

* * * * *

Recently Bevan succeeded in infecting a rabbit with trypanosomiasis by inoculation with 2 c.c. of blood from an ox suffering from the trypanosomiasis at present existing in the Hartley district. This

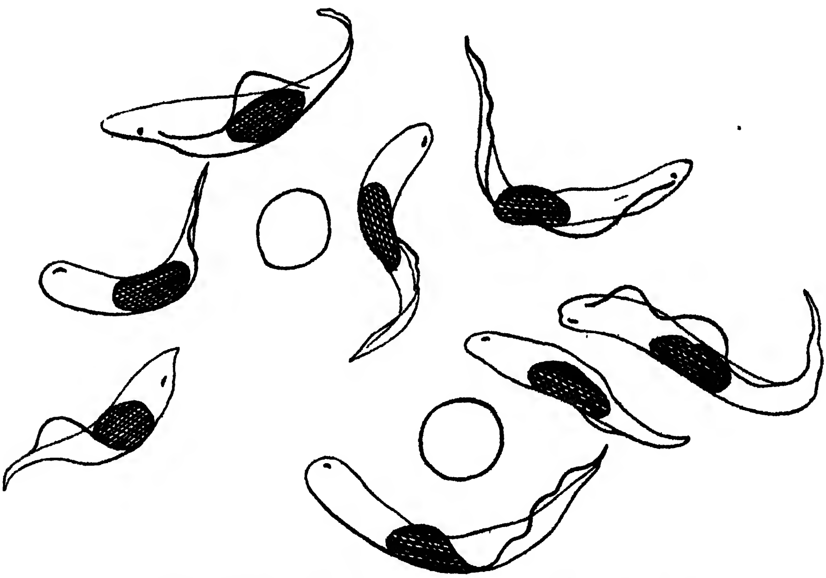


FIG. 1.—Trypanosomes seen in Blood Smears of Calf sixteen days after inoculation with "Hartley" Blood.

animal died unexpectedly in his absence on the seventeenth day after inoculation, but some blood smears were taken before putrefaction had become too far advanced. Specimens were sent to various authorities. McFadyean failed to stain any of the preparations well with Giemsa, and could not get the membrane or flagellum well shown. He therefore found it difficult to offer an opinion as to the species of trypanosome present, but wrote, "As far as I can judge, they do not correspond with the *T. dimorphon.*"

Mesnil also hesitated to express an opinion on coloured preparations, but to him the trypanosome appeared to be *T. dimorphon* (*sensu stricto*). Specimens from the same rabbit, together with other smears from "fly-struck" cattle at Sipolilos, were sent to the Director of the

Sleeping Sickness Bureau of the Royal Society, who found in one of the Sipolilos slides that trypanosomes were numerous and certainly suggestive of *T. dimorphon*. In all that he could clearly see there was no free flagellum.

It may be found that the parasite is neither *brucei* nor *dimorphon* (*sensu stricto*), but a distinct species.

With regard to the trypanosome recently found in cattle in Southern Rhodesia it has to be admitted that circumstances have prevented any careful or minute laboratory observations. Work in

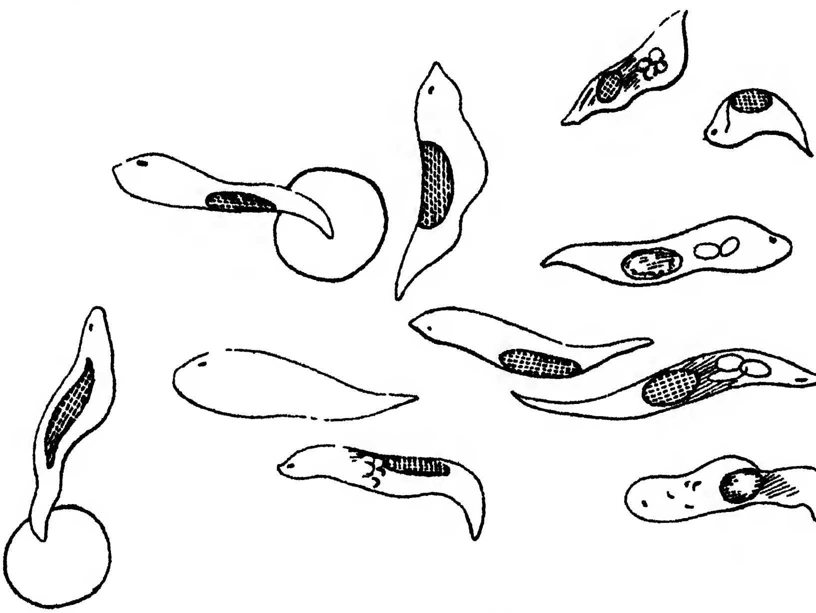


FIG. 2.—Degeneration forms of Hartley trypanosome from blood of dead rabbit.

the field involving long journeys in the endeavour to determine the number and extent of infected herds and districts, the collection of evidence bearing on the problem of the transmission of the disease, the fact that the majority of infected animals had died before the writer's return in May, leaving only a few chronic cases in which parasites were few or difficult to find, and that inoculated laboratory animals have shown a marked resistance to inoculation, have all combined to render laboratory investigations irregular and incomplete. For these reasons the following observations may subsequently be found to require alterations and amendment. In cases of natural infection (cattle) the parasites have been very scarce, even when the

blood or gland smears have been made from dead animals or those known by their clinical manifestations to be severely affected. In several such cases a cover-glass preparation has contained only one or two specimens.

This accords with the experience of Dutton, Todd, and Kinghorn, who, in connection with the cattle trypanosomiasis in the Congo Free State, found that in some cases "every means may frequently fail to show the parasite in infected animals." Montgomery and Kinghorn also record similar experiences.

Morphology.—In blood smears from sick cattle in the Lomagundi and Hartley districts the trypanosomes met with have corresponded to the "long" and "intermediate" forms pictured in the illustration in Laveran and Mesnil's work, "Trypanosomes and Trypanosomiasis," p. 242.

True "tadpole" forms and "long" forms with definite free flagellum, as figured in Dutton and Todd's report, have not yet been encountered in naturally infected animals.

Leishman's stain does not colour the protoplasm very deeply; Giemsa's gives it a puce colouration; the latter brings out an undulating membrane very little festooned. It is best seen when the preparation is rather over-coloured. A free flagellum (*sensu stricto*) has not been seen, but the protoplasm anterior to the nucleus tapers off gradually to the extremity of the membrane. Chromatic granules and vacuoles have not been seen in natural cases. The centrosome is situated laterally a little distance from the posterior extremity, which is blunt or conical; "pike" forms have not been noted. The posterior extremity takes the colouring very faintly. The nucleus is irregular; Laveran's stain brings it out most clearly, and gives it an oval shape. The red staining matter appears fragmented. By other methods of staining it appears irregular and elongated, occupying the whole width of the parasite. Fission forms have not yet been observed, but one parasite with two flagella has been noted.

The measurements made vary from 15 to 30 μ in length, and from 1·5 to 3 μ in width; forms about 30 μ long predominate. The trypanosome not a little resembles the illustration of *T. nanum*, figured in the Third Report of the Wellcome Laboratories, p. 137, but without the free flagellum. In a blood smear from one badly infected animal at Sipolilos which had recently come from North-eastern Rhodesia, a single giant trypanosome, recalling *T. theileri*, was seen. Although many thousands of blood smears from sick cattle in all parts of Southern Rhodesia have been examined by the writer during the past

few years, this is the first occasion on which he has met with a trypanosome of this type.

With regard to the Southern Rhodesian trypanosome herein referred to, it is suspected that investigations may prove that it is not identical with *T. dimorphon*, and research will have to be carried on in the lines suggested by Bagshawe.

There can be little doubt that field observations are of as great importance as laboratory investigation, since, in the latter, results are often vitiated by different methods of technique. The virus is modified by time and passage through animals which are not the natural hosts of the organism; the experimental animals are kept in unnatural surroundings which tend to influence the course of the disease.

The most accurate results could only be hoped for by a combination of field and laboratory experiments on the spot.

Animals Susceptible.—In this connection some interesting observations have been made in connection with the Hartley trypanosomiasis. While the transport oxen engaged between Gatooma and the "Golden Valley" have contracted the disease and died in great numbers, donkeys working at the same time and at the same mines, being subjected to practically identical conditions, have escaped. In the same district a transport agent has been using some twenty mules continuously for the past eighteen months, and has frequently exposed them in the most dangerous localities. The argument that these animals travelling at a greater pace than oxen are submitted to less danger will not hold good, since they have been out-spanned and allowed to graze in well-known fly areas. Nevertheless, not a single death or case of sickness has occurred, and, in spite of hard work, they are all in good condition.

Similarly not a single mortality from "fly" has occurred among the police horses and mules which have patrolled the district regardless of danger.

A mine-owner in shifting his "plant" from one property to another worked oxen and mules alike along the same road through a "fly-belt." The oxen died, but the mules are alive and apparently in good health.

At one mine cattle and donkeys were working; the former are all dead, the latter all alive at the time of writing. At this mine two English-bred dogs have been exposed without harm throughout the whole "fly" season. Every time the cattle came to this mine "tsetse" came with them, and were afterwards caught in the windows of the house, a fact which may be of interest to entomologists. The dogs

which were generally in or near the house must have been frequently exposed to infection.

Symptoms.—The cases of trypanosomiasis of cattle in the Hartley district of Southern Rhodesia seen since May have been examples of the chronic form of the disease, the animals acutely affected dying earlier. The majority of deaths occurred between January and May, an explanation for which may perhaps be found in the circumstance that blood-sucking flies of all descriptions, and among them the *Glossina morsitans*, were most numerous and active during the hot, sultry weather of November, December, and January.

These early acute cases were not very carefully observed, but cattle inspectors and others have told the writer that they frequently met with temperatures as high as 106° F. and mortality among cattle in good condition. On the other hand, the chronic and lingering cases seldom show an elevated temperature, and not infrequently a subnormal one is met with even in the extreme heat of the day.

These sick cattle, which have survived the wet season and have reached the cold, dry months of July and August, are not only reduced to a skeleton by the disease, but are also handicapped by the poverty of pasture. It is sometimes extremely difficult to determine whether specific disease or hard work and lack of food is responsible for the poor condition of the animal.

"Fly-struck" animals, as a rule, have a hard, dry coat, the hair standing on end and appearing very coarse and dusty. In places the hair falls off, leaving a bare patch, from which the skin peels off in flakes. The animal is "hide-bound," "tucked-up," and shows no inclination to lick itself. Tears run from the eyes and strings of mucus from the nose, and saliva dribbles from the mouth. The prescapular glands may or may not be enlarged. In some undoubted cases of the disease the glands were not more prominent than normal.

The animal is seen at its worst in the morning, when it often refuses to rise, and is loath to leave the kraal. In nearly all far-advanced cases there has been great weakness of the hind-quarters, the animal swaying and dragging its legs; it is often too weak to lift its feet to avoid a stone.

The muscles of the hind limbs and quarters waste away, the anus is retracted, and the sphincter seems to lose its power, so that fæces accumulate in the hollow beneath the tail. Chronic diarrhœa is frequently met with, together with the loss of power to regulate the discharge of fæces; the animal's hind-quarters thus become foul and scalded.

The animal feeds greedily; even in those cases where it is too weak to stand up it will lie feeding the whole time, even up to a few hours before death. The mucous membranes are anæmic, and the pulse is weak and fluttering.

The foregoing notes are based upon a preliminary observation of the disease, and time and experience may bring to light many inaccuracies.

EPHEMERAL FEVER OR THREE DAYS' SICKNESS IN CATTLE.[1]

By G. W. FREER, M.R.C.V.S.
Cape Town, South Africa.

The disease "ephemeral fever," or "three days' sickness," is one of the many plagues with which South Africa seems to be peculiarly cursed, but unlike many of the others, it has, fortunately for us all, caused no great mortality up to the present. The scientific term "ephemeral fever," as well as the lay term "three days' sickness," are both somewhat appropriate, as in the great majority of cases the disease quickly runs its course, and all acute symptoms have disappeared at the end of three days. The earliest report of this disease is that of Mr. Bevan, one of the Rhodesian Government Veterinary Surgeons. In an article contributed to the *Journal of Comparative Pathology*, he states that the disease first made its appearance amongst cattle in North-western Rhodesia, and was investigated by Government Veterinary Surgeon Edmonds during the latter part of November, 1906. On January 7, 1907, the disease appeared a few miles south of Buluwayo, and from there it gradually spread until it reached the Transvaal and Natal, where outbreaks were officially notified during the last week in March. Mr. Bevan in his report makes mention that several of the old Matabele natives state that the disease has been in their country before, and a reliable native driver, who accompanied the pioneers to Rhodesia, stated that it existed in Khama's country about twenty-five years ago.

Some few weeks ago I obtained from the Uitenhage Library a book of travel called "The Heart of Africa," written by Dr. George Schweinfurth about the year 1867, in which he describes a disease among the native cattle of Central Africa, the symptoms being identical with those of the "three days' sickness." I am of the opinion that this is no new disease to the African Continent, but has been in existence for generations, and it is only on account of the

[1] Contributed to the *Agricultural Journal of the Cape of Good Hope.*

country being now opened up to traffic that it has commenced to spread in new areas. With regard to outbreaks in this colony, cases were reported in the Vryburg district by Government Veterinary Surgeon Simson during February, 1907, and a little later in the Transkei by Veterinary Surgeon Hutchence. The disease then slowly travelled down until at the end of 1907 outbreaks occurred in the Uitenhage and adjoining districts, where with intervals of quiescence it has remained ever since.

Cause and Mode of Infection.—Ephemeral fever is due to the entrance into the system of a specific organism, and can be transmitted to a healthy animal by inoculation with blood from a sick animal. Cattle of all breeds, and in all conditions, whether fed on sweet veld or sour, karoo or coast veld, are susceptible to this disease. I have noted that young calves seem to possess a greater resistance to natural infection, and fat and stall-fed cattle usually show more acute symptoms than those in low condition. Mr. Robertson, the veterinary bacteriologist, during the course of a series of experiments, found that cattle showed signs of sickness from two to three days after inoculation with virulent blood. We might reasonably conclude, therefore, that the period of incubation is from two to three days. He also found that one attack conferred an immunity for six weeks and that the blood of a recovered animal did not produce the disease if bled when all the symptoms had subsided.

The tranmission of the disease in nature is probably through the agency of night midges, in the same manner as malarial fever of sheep. This would account for the fact that cows, kept for long periods in yards in town entirely isolated from others, have contracted the disease. So far transmission experiments conducted with ticks have failed.

Symptoms.—These in the majority of cases are so very marked that there is no great difficulty of diagnosis. The general appearance of a bovine suffering from an attack of "three days' sickness" is very much like that of the wooden cow we obtained from the toy shop in our early youth. There is the same characteristic look of extreme helplessness, with the evident disinclination to move unless assisted. The principal symptom is stiffness of one or all of the extremities, and usually of the whole body. One peculiarity is that the stiffness may rapidly pass from one limb to the other. The earliest indications of an attack are loss of appetite and suspension of rumination, a rise of temperature with roughness of the coat, and a watery discharge from the eyes and nose. In a few hours these symptoms rapidly develop

when the temperature may reach 106° F. Painful lameness appears in one or more limbs, or general stiffness of the whole body. The stiffness of the neck with more or less inability to swallow is very characteristic. The mucous membrane of the mouth becomes reddened, the eyelids swollen, and the eye glaring in appearance. The bowels may be relaxed, but in the majority of cases are constipated, the fæces being covered with strings of mucous. In cases where the sick animal lies down there is inability to rise, and when placed on its feet there is evidence of loss of power, and it quickly resumes the recumbent position. In about forty-eight hours the temperature falls nearly to normal, appetite returns, acute symptoms disappear, and in the greater percentage of cases the animal is convalescent at the end of three days. I have frequently seen cases where the symptoms have been so severe that one has felt doubtful as to whether the attack may not prove fatal, and find the patient on the following morning with no trace of disease, and feeding well.

In some instances complications may arise and the symptoms persist for two or three weeks. These cases are fortunately rare.

Post-mortem Appearances.—As the majority of deaths usually put down to "three days' sickness" are found on investigation to be due to other causes, one rarely finds a fatal case where the *post-mortem* symptoms are typical. The following are the most important: Enlargement of almost all the lymphatic glands of the body, particularly those in front of the sternum or breast-bone. They show areas of hæmorrhage, and are more juicy than normal. Slight reddening of the mucous membrane lining the fourth stomach and intestines, no other lesions are constant. These symptoms are taken from cattle suffering from a typical attack, and destroyed by Mr. Robinson, the veterinary bacteriologist, for the purpose of investigation.

Mortality.—The mortality from the disease itself has been almost *nil.* Numerous deaths have been reported, but in those cases where I have been able to make a *post-mortem* examination I have invariably found that the loss has been due to some complication. In those cases where the animals are suffering from stiffness of the neck, and owners persist in pouring down all kinds of noxious fluids, there is every probability that death will ensue from pneumonia. The unfortunate animal being unable to swallow properly, the fluids naturally gravitate down the trachea into the lungs. Deaths from redwater and other like diseases have been frequently mistaken for ephemeral fever. It can be reasonably understood that where there are several cases in the one herd the owner might think that each fresh case was

due to the same cause, and in the majority of instances consider it unnecessary to inspect the animal. Since the introduction of ephemeral fever, there has been a considerable increase in the number of cases of redwater, even on farms where cattle have been considered salted for some time. I am of the opinion that this is due to the attack of ephemeral fever so lowering the tone of the animal's system as to lose its resistance and so enable the redwater parasites to gain the upper hand.

Immunity.—Veterinary Surgeon Bevan, in his report to the *Journal of Comparative Pathology* of June, 1907, stated that there is no record of an animal having suffered from a second attack of the disease. Although it has been my experience to find that in a large percentage of cases one attack does confer an immunity for a considerable time, still I know of numerous cases where cattle have had two and three attacks, and only a month ago I saw two cows, the owner of which assured me that they were suffering for the fourth time. In the majority of cases the second attack is worse than the first.

Treatment.—In this disease, the less the patient is interfered with the better will be the results. In the event of the bowels being very constipated, a dose of Epsom salts would be beneficial, but I would advise great care being exercised in administering it, especially when the neck muscles are affected. I strongly recommend keeping the animal in a cool, shady place (if possible), attend to its general comfort, and leave the rest to Nature. From time to time numerous so-called remedies have been advocated as certain cures for this disease, but I am convinced that they are all equally worthless. Transport oxen should not be inspanned for at least a fortnight after recovery, as they are quite unfit for work before that time. Many farmers have found that out from very bitter experience. As the disease can be communicated by direct inoculation, Mr. Robertson, the veterinary bacteriologist, recommends this course to transport-riders who wish to get their spans through the disease, and have done with it. It is certainly better to have all the cattle affected at one time than to be worried with isolated cases for weeks, which probably keep the infection alive on the farm.

As far as preventive measures are concerned, none are known at present, but as the disease is carried by insect life, there is a possibility that some application can be found which will assist in keeping them off the animal, although the expense and trouble of applying it may be more than the pecuniary loss from the disease itself.

Clinical Articles.

A PRELIMINARY NOTE UPON THE NEW OPERATION FOR ROARING IN HORSES.

By FREDERICK HOBDAY, F.R.C.V.S., F.R.S.E.

Kensington, London, W.

The question of the cure of "roaring" in horses has occupied many minds, and it is scarcely necessary to discuss here the numerous operations and suggestions which have been attempted. Suffice to say that up to the present none have claimed to be absolutely a specific. The extraordinary success which has, however, followed a brief series of cases which have been operated upon by the method originally suggested by Dr. W. L. Williams, the Professor of Veterinary Surgery in the Cornell University Veterinary School, Ithaca, New York, made me anxious to put them on record with a view to encouraging others to perform the operation, and thus to obtain percentages and statistics; for the number of "roaring" hunters and racehorses in this country is "legion," and it is during the hunting season that one has the opportunity of discovering likely patients who would otherwise be sold, shot, or have tracheotomy performed before another hunting year. Williams' operation has the distinct and definite advantage that it does so very little damage to the cartilages of the larynx. Beyond splitting the cricoid cartilage in order to thoroughly expose the interior of the larynx the cartilage tissue is not damaged at all, and in a recent letter which I have had from Professor Williams (dated December 8, 1909) he states that in some cases even this can be avoided; he writes "The two last cases I have operated upon without difficulty through the crico-thyroidean ligament, without wounding a cartilage at all." The failure of the arytenoidectomy operation was largely due to the fact that the larynx suffered so much damage, and granulation tissue gave so much trouble afterwards. In Williams' operation the object is to strip off all the mucous membrane which lines the ventricle of the larynx, thus making two raw surfaces, which eventually adhere and "cause the arytenoid cartilage to become fixed against the side of the glottis by cicatricial adhesion."

The method of operating is as follows: The horse is cast, chloroformed deeply, and placed on its back with the throat well extended. The region of the throat and larynx is shaved and rendered antiseptic. The larynx is then located and cut down upon (a very good guide being

an imaginary line drawn across behind the angles of the jaw), care being taken to incise between the muscles and to separate them carefully in order to avoid hæmorrhage as much as possible, and the crico-thyroid ligament is then exposed. This is incised with a scalpel, and the cricoid cartilage, which is very hard, is split with a fine-toothed saw. As stated a few lines above, Professor Williams has managed on two occasions to operate without damaging this cartilage at all. Tracheotomy is not necessary, and was not performed in any of the undermentioned cases.

A specially shaped retractor is now introduced and the two cut edges of the larynx held well apart, so that the interior can readily be viewed. One notices the vibrating right vocal cord (if this one is healthy) with each act of respiration, whilst the left one lies quite still and is paralysed. With a long, specially made, tenaculum forceps, the mucous membrane lining the interior of the larynx is grasped and pulled tense, whilst an incision is made behind it with a long, double-edged, razor-bladed scalpel. This incision is continued until the whole of the mucous membrane lining the ventricle has been incised, or, if the operator prefers it, when once the incision has been started, the greater part of it can be separated with the handle of the scalpel, some blunt instrument, or even with the finger. The interior of the larynx is then swabbed with sterile wadding tampons, and the patient allowed to come out of anæsthesia.

After-treatment consists in dressing the wound antiseptically each day, two or three times at first, then finally once or at discretion, and in from three to four weeks there is only a small scar left to denote the site of operation. As soon as the wound has healed the horse may be taken to gentle exercise and gradually got into condition.

The following four cases illustrate the operation clinically, and are, I believe, the first to be done in England; although for the past four years the operation has been done in America. Numbers 1 and 2 were done at my request by Professor Williams, who very kindly explained each step and freely showed myself and a number of veterinary friends who were present every detail.

CASE 1, September 10, 1909.—A bay half-bred hunter gelding, aged about 9, a big upstanding horse and a heavy-weight hunter. This animal was a great favourite of the owner, and had been a "whistler" for some time, but at the end of the last season had become a distinct "roarer," and could not gallop far or up an incline without exhibiting signs of great distress.

The operation passed off satisfactorily, the wound healed well, and

on October 7 the horse was lunged by Mr. Guy Sutton, F.R.C.V.S., in a small circle without showing the slightest distress, and without those around being able to detect any noise. On the 9th he was ridden twice at a gallop round a large field, making only a very slight noise, and then returned to the owner. After a couple of months of exercise he was taken into the hunting field, and the owner has been very delighted with the result, as the horse gallops well without any distress, and makes no abnormal respiratory sound at all.

CASE 2.—Bay thorough-bred hunter gelding, aged 8, the property of a lady, a keen rider to hounds. This horse was operated upon on the same day as Case 1; the result was equally successful, and the horse was sent into Somersetshire on October 10. On the 11th I received a note acknowledging the safe arrival of the horse, the owner stating that they noticed "no noise such as he had used to make when walking up the hill from the station." On the 15th I received a note to say that he had been trotted up a steep hill without any sound being observed, whereas previously, even at a walking pace, he made a noise. On the 23rd further confirmatory evidence of this was sent in a letter; "he can now trot uphill without making a sound, which he would not do before his operation. We all think he is cured." He was taken out afterwards with the staghounds and gave every satisfaction, and on November 18 I personally tested the horse in a two-mile gallop, which the animal could not possibly have done before without showing great distress, and the result was in every way satisfactory, as no abnormal sound could be detected. Since then the improvement has been maintained. This horse had strangles as a yearling out at grass and had been a whistler ever since.

CASE 3.—A bay hunter mare, aged 8, a frightful roarer. This animal could not gallop a quarter of a mile without evincing the greatest signs of distress. Operated upon on November 9, the wound gave no anxiety, and on December 3 the animal was tested. The improvement was marvellous, as no distress was evinced and no abnormal sound at all could be heard whilst the mare trotted and cantered freely and easily. On the 15th she was tested up and down a hill at a smart gallop without the slightest distress. This improvement has been maintained.

CASE 4.—A brown hunter gelding, aged 7, a very bad roarer. This animal, like Case 3, could not gallop more than a few hundred yards without evincing the greatest distress, and was operated upon on November 13. In this animal a much larger portion of mucous membrane was removed than in previous cases, this including that

covering the ventricle of the larynx. The wound healed well, but recovery was somewhat retarded by a slight attack of liver congestion. The report upon this horse is that when galloped he "whistles" slightly, but as the animal is altogether out of condition it is possible even this may disappear. At any rate, even now he is greatly improved.

Remarks—The remarkable success which has attended each case makes it worth while to publish the facts, even although only in a preliminary form. The horses will be closely watched and critically examined, and I purpose to trace them up from time to time with a view to observing whether the improvement is, or is not, a permanent one.

CERVICAL TUBERCULOSIS AND FRACTURED FIRST RIB IN A MARE.

By C. PACK, M.R.C.V.S.
Lymington, Hants.

In June, 1908, I was requested to attend a cart mare, aged 6. I had known the mare for some two or three years, and had attended her late in the previous year at an abortion.

I found her scarcely able to move, the muscles of neck and forearm being very tender and stiff; temperature 104° F., pulse 70. When moved her gait suggested laminitis of the fore-feet. She was unable to lower her head. I could discover no trace of tetanus, and dismissed the idea of laminitis.

Having recently experienced two other cases with somewhat similar symptoms, both of which eventually recovered and are working at the present time, I diagnosed the case as acute rheumatism, and treated accordingly. Three months' treatment failed to effect any improvement, and the owner decided to await events and give Nature a chance.

During the treatment the hind limbs and back appeared to be sometimes affected, but the muscles of the neck and the cervical vertebræ retained their soreness all the time, although she managed eventually to feed off the ground.

Late in the year a case of tubercular ostitis, reported by a North-country practitioner, appeared to me to be on all fours with the present one, and I communicated my fears to the owner, and suggested the "tuberculin" test, to which he (the owner) demurred. So the case went on. On one occasion she got down in her box and had to be

assisted to rise, the aid of the slings being necessary. Her appetite remained good, and there was no great loss of flesh.

In July of this year, being at the farm, the owner mentioned that the mare had much improved, and turned her loose in the lane for me to see her improved action. She came down the lane at a trot, and when opposite her box made a big stumble, and hobbled in very lame. I suggested her feet being shortened as they had grown very long. This, I understand, was done with difficulty. About a month later I was asked to see her again, when I found her with a dropped elbow. I was informed that this condition appeared a day or so after I saw her last. I at once diagnosed fracture of first rib, and advised that she be destroyed.

This was carried out, and to confirm my diagnosis I made a casual *post mortem.* On discovering the fractured rib, I was struck with what appeared to be bony deposit there, and asked the slaughterman to remove both front ribs and some cervical vertebræ and boil them out for my future inspection. On examining the bones after boiling, the two last cervical and first dorsal vertebræ were seen to have been extensively affected with ostitis. They were much enlarged and porous, and were ankylosed. The upper part of the fractured rib was similarly affected with ostitis, and the other rib showed deposits indicating the commencement of the same condition there. I did not notice any tubercular deposits in the contents of thorax, but regret now that I did not make a more complete *post mortem*, as by the time I obtained the bones the carcase had been made away with. I have no doubt the fractured rib was caused at the time the mare stumbled.

TUMOUR OF ONE HORN CORE IN A HEIFER.

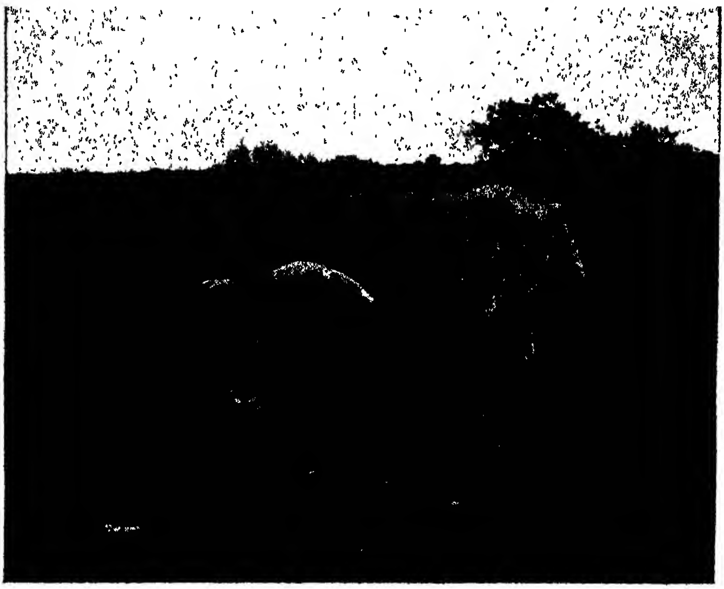
By C. PACK, M.R.C.V.S.
Lymington, Hants.

In May, 1908, my attention was called to a two-year-old heifer with one horn much more developed than the other. Despite its size the horn itself appeared quite normal, but very thick at the base, as though expanded by an enlarged horn core. It did not appear to be a case for treatment, and none was adopted.

I saw the heifer occasionally out of curiosity. Her health did not appear to suffer or be impaired in any way. She calved down and became a useful milker, but the extra length of one horn was a decided inconvenience to her in the stall. It continued to grow out of all proportion to the other one, and in July of this year I received a message that a blood-vessel had burst in the poll and the animal had

almost bled to death, but "that a pad of cobwebs and a bandage had eventually arrested the bleeding."

This with the consequent loss of appetite reduced the animal's condition. I removed the pad, cleansed the wound, and discovered a ragged wound at the base of horn, from which the bleeding had taken place, and could distinctly see the pulsation of a fairly large artery. I applied some Stockholm tar, and a pad of Petanelle wool, and bandaged it down, and all went well for a time; but early in September the horns were sent me with a message that the bleeding had recurred and the animal had bled to death, the stream of blood being of sufficient force as to form an arc backwards, falling on the cow's quarters.



The photograph shows clearly the deformed horn.

The horns were both detached at the base after death and boiled, so that it was impossible to make a histological examination. The horn core was very much enlarged, and contained cavities. It is probable that the condition was carcinomatous in origin. The size of the horn can be imagined from the following dimensions: The circumference of the diseased horn at the widest part measured 16 in., and the length along the greater curvature was 22 in. The normal horn only measured 6 in. at its widest circumference, and 10 in. along the greater curvature.

The accompanying photograph was obtained after the first hæmmorhage occurred.

SULPHUR POISONING IN HORSES.

By H. W. PERCY, M.R.C.V.S.
Chatteris, Cambs.

On Sunday, September 5, I was called out to attend some horses which were reported to me as being seriously ill. When I arrived at the farm I found that one of the animals had already died, another appeared in a very precarious condition, and several others were obviously ill. Suspecting that the animals were suffering from the effects of some irritant poison, I questioned the men, and elicited the following history:—

History.—It appears that it was usual on this farm to give each of the horses a dose of sulphur every Saturday night, to keep their blood in good condition, as the owner described it. On making enquiries I found that each animal was supposed to have about ℥ii., but in reality they were given half a cake-tin of sulphur between every five horses, which on weighing worked out at something over ℥viii. each.

The sulphur was given in a dry condition mixed with chaff, oats, and beans. The horses were not tied up in the usual fashion when feeding, so that the horse which ate most food no doubt ate the most sulphur.

Symptoms.—The animal most affected appeared very dull and suffering great pain. The pulse was weak, quick, and easily compressed. Temperature 104° F.; respiration rapid and laboured; slight quivering of the muscles of the forearm; mucous membrane injected; difficulty in swallowing.

From time to time the animal passed some quantities of soft fæces of a clay colour. The urine was of a high colour; acid reaction; specific gravity 1040; contained albumin. On adding a solution of barium chloride to some urine to which a few drops of hydrochloric acid had been added to prevent precipitation of phosphates, a considerable precipitate of barium sulphate was thrown down. The following day the pulse was much weaker and respirations more laboured. Profuse diarrhœa of a very disagreeable odour, not unlike that of H_2S. Shreds of mucous membrane and sulphur could be detected in the fæcal discharge.

Treatment.—In order to control the irritation and get rid of the irritants, castor-oil, eggs and milk were given; for the pain chlorodyne, and for exhaustion Irish whisky. All the sick horses were treated alike and recovered.

Post Mortem on the Horse found Dead.—Intense inflammation of the stomach and intestines. Both organs contained a large quantity of

sulphur mixed up with the ingesta. I made a most careful examination of the contents of the stomach and intestines and a small portion of the liver, but failed to find the slightest trace of any other irritant poison. The sulphur was of a darker shade than usual, and of an acid reaction. On testing it showed the presence of sulphates and chlorides, but not of arsenic or calcium.

Action.—Sulphur when taken internally is partly absorbed from the intestines as the sulphide of an alkali. Its action is entirely due to the sulphide formed, sulphur itself being an inert substance. The portion absorbed is excreted as sulphate in the urine, which, no doubt, explains the considerable proportion I got with barium chloride when examining the urine. Its laxative action is generally accompanied by a most offensive odour of sulphuretted hydrogen, which is characteristic. The gas, I believe, is so freely generated and absorbed that it is capable of causing systemic poisoning. It is said that sulphur gives a disagreeable odour to the breath, but in the above case I failed to detect it.

Remarks.—The foregoing is only one of a number of cases of the kind which I have come across, and I am inclined to believe that it is more common than is supposed amongst the members of our profession. In the recent work on "Veterinary Toxicology," by J. A. Nunn, no mention of sulphur-poisoning is given.

From time to time I have been asked to attend cases of diarrhœa which has been brought about by the administration of sulphur by irresponsible persons. Not only is this drug poisonous to the horse, but, I believe, more common and more fatal in the pig. During the time I was professionally engaged by the Board of Agriculture, I met with numerous deaths wholly and solely due to overdosing with sulphur. My experience is that very few farm labourers have the bump of size and weight sufficiently developed. They have no idea of proportion; they cannot tell whether a thing is 2 oz. or 8 oz., and very often do not care.

In conclusion, I should like to say that I consider sulphur very poisonous if given in larger quantities than 8 oz. Small doses should always be administered the first time, as animals acquire a certain degree of immunity or tolerance to the drug. In nearly all the cases which come under my notice large doses of the drug had been given for the first time. Never give sulphur in large doses to an animal which has a tendency to scour as from worms, for when once diarrhœa has started it almost invariably proves fatal. I expect it is hardly necessary for me to warn the members of our profession of the

very dangerous explosions which occur when this drug is triturated with potassium chlorate. This may appear to some to be a small matter and often overlooked, but I regret to say that such careless handling has cost more than one life.

A MUMMIFIED FŒTUS.

By D. FORWELL, M.R.C.V.S.
Towcester.

On October 8, 1909, I was requested by a client, who breeds Jersey cattle, to go and see one of his heifers. When I arrived I found this heifer showing a piece of putrid placental membrane hanging from the vagina. I asked the bailiff when she had calved, and he said she had been put to the bull on November 5, 1908, but he said he thought she was barren. I made an examination *per vaginam*, but could find no trace of any calf, so I presumed she had already "slipped calf." I removed the placental membranes and gave her the necessary antiseptic injection to uterus. I heard no more of this case till November 10, 1909, when I was asked to see this same heifer, as she was discharging some filthy matter from the vagina. I again tried to make an examination of the uterus, but was quite unable to get my hand into the vagina, as she was so very small. I again gave her an antiseptic injection, and left an injection syringe and antiseptic to be used on her twice daily.

On November 13, 1909, at 9 a.m., I had an urgent message to go and see this heifer. On my arrival I found a small, hard mass showing in the vagina, the surrounding parts very much swollen, and the heifer straining very much. I fixed a steel hook into this mass (the head of a calf), and, after gentle traction for some fifteen minutes, abstracted a calf about the size of a fox-terrier. There was no hair or skin, and very little flesh left on this calf, and the skeleton was all more or less shrivelled up and partly calcified. The heifer, to my surprise, has never shown any "labour pains" of any description till Saturday morning, November 13, 1909, when I went and removed this calf. The heifer was "bulled" on November 5, 1908 (verified by books kept exactly), so she ought to have calved about three months or more sooner than she did. I have never known a cow carry a dead (or live) calf as long as this, and also it seems strange that the heifer should show little or no discomfort, as she fed well all the time. She is now quite all right again.

SUCCESSFUL TREATMENT OF STOMACH STAGGERS IN A CALF BY SOURED MILK.

By T. F. PRIME, M.R.C.V.S.
Norwood, S.E.

A few months ago a friend, who is a large dairyman and breeder of prize dairy cows, complained to me that he had recently lost several very valuable calves from stomach staggers, which he thought was due to overfeeding, these animals being hand-reared. He also stated that he had tried the usual treatments, but his results had been fatal. As there was always a lot of prepared soured milk on the premises for sale, I advised that the next case should be treated with soured milk. A few days later a very valuable calf who was being hand-reared was taken ill, and by my advice the owner commenced the treatment. This consisted of giving the calf instead of medicine or food only soured milk, in the same quantity and at the same intervals as the ordinary food had been given.

This treatment has been completely successful, whereas in the three previous calves attacked all treatment had failed. I ought also to mention that the one treated with soured milk appeared at first to be more depressed and ill than the previous ones. I certainly think that the treatment is worth of a further trial in stomach derangements of the calf, especially when accompanied by diarrhœa.

IMPERFORATE ANUS IN A CALF.

By P. S. MUNSHI, G.B.V.C.
Veterinary Surgeon, Manavadar.

I came across, in my practice, a case of a calf which was born with an imperforate anus. This is so comparatively rare that I hope it will be of some interest to the members of our profession. The history of the case is as follows :—

On October 2, a pure Gir Kathi cow, belonging to a farmer of this place, was delivered of a calf with an imperforate anus. To rectify this natural defect, and to make an artificial anal opening for the proper exit of fæces, the owner took it to a quack, who, however, operated at the wrong place. The result was that the calf could not get himself relieved of the impacted intestines.

When on the 5th the calf was brought to me for treatment in a somewhat comatose condition, I first got the wrongly operated part sutured up like an ordinary wound, and afterwards operated on the right place; thus the exit of the effete materials was facilitated by warm water enemas. The operated part was then treated like an ordinary wound, and the said calf can now pass its dung and fæces without the slightest inconvenience.

Canine Clinical Notes.

VACCINE THERAPY AND THE TREATMENT OF FOLLICULAR MANGE.

By A. E. METTAM, B.Sc., M.R.C.V.S., &c.

Principal of the Royal Veterinary College of Ireland, Dublin.

THE Editor has asked me to write a short note relating to the above subject. The treatment of follicular mange may be said, without fear of contradiction, to be far from satisfactory and more or less experimental. Many remedies have been suggested, but none are satisfactory, none give a majority of successes in a minimum of time. It may be that, as some of us believe, we have been too much influenced with the idea that the cause of the condition is the Demodex and have lost sight of the fact, if we ever appreciated it, that the lesion of the skin is due to the activity of a micro-organism causing suppuration. The extract published in the *Veterinary Record* of a paper by Professor Gmeiner, in the *Berliner Tierärztliche Wochenschrift*, induced me to give the results of vaccine treatment in a dog that I had under observation in the laboratory. The treatment had already commenced before the extract of the paper appeared, and before I was aware of Professor Gmeiner's opinions.

In follicular mange, if the lesions be examined small beads of pus may be readily expressed on slight pressure, and if this pus be examined there is little difficulty in discovering parasites in variable numbers. If a smear of pus be made and stained, say by Leishman's stain, there are also readily found numerous cocci, some free, others, not usually many, in the interior of leucocytes. The question then arises, is the lesion due to the demodices or to the cocci? Whether the demodices are the agents whereby the skin is injured and infection by these saprophytic cocci facilitated does not concern us now. Is the lesion a suppuration of the skin, and if we check the ravages of the causal agent can we arrest its spread? This is the question to solve, and upon its solution will depend the treatment. I had concluded from observation that the demodices probably had little to say in the development of the lesion, and that possibly the cocci were the cause; and I determined to try the effect of a vaccine prepared from the cocci isolated from the lesion of the animal under observation.

The animal is an Irish terrier, and the lesions extended over the whole of the head, front of the chest, and the limbs. The parts were almost denuded of hair, thickened, seething with pus, fissured, and

here and there suppurating sores. There was an intensely repellent odour; the conjunctivæ were covered with pus, and the animal in wretched condition. A portion of one limb was disinfected and a droplet of pus squeezed out; this was sown upon agar slants and the tubes incubated. Pure cultures of the *Staphylococcus pyogenes albus* were obtained and these reinoculated upon other agar tubes. The *S. pyogenes albus* appears to be the common cause of this form of suppuration. The vaccine is prepared as follows: The cultures grown upon agar are washed off with sterilized salt solution, and the suspension obtained is sterilized at 56° C. for an hour or an hour and a half. To make certain that the suspension is sterile tubes are inoculated from the suspension and incubated; no growth signifies sterility. The number of cocci in unit volume are counted, using one's own blood corpuscles as an index—*i.e.*, in a known quantity of blood, suspension and dilution used, we compare the numbers of corpuscles and cocci. We know the number approximately of red corpuscles in 1 c.mm. of blood, and then by a simple proportion sum we can estimate the number of cocci present in 1 c.mm., and multiplying this by 1,000 we have the number in 1 c.c. of fluid.

Before administering the vaccine it is usual to note the opsonic index of the patient's white blood corpuscles—that is, to note their phagocytic avidity. In cases of furunculosis, sycosis, and in suppurations generally, the opsonic index is low—that is, few cocci are phagocyted. In the treatment by vaccines the object is to increase the opsonic power, to stimulate the leucocytes to greater activity and greediness, and thus to cut short infection, limit invasion, and strengthen the natural defences. The opsonic index is reckoned in the following way: A quantity of blood is obtained from the patient; it is centrifugalized, and the serum obtained. Blood is obtained from another animal, preferably and in our case another dog, mixed with citrate of potash solution to decalcify the blood and prevent coagulation, and then centrifugalized. The precipitated corpuscles are washed with normal saline and again centrifugalized. This operation may be repeated several times, the object being to free the corpuscles from any serum of the normal dog. The white blood corpuscles are next taken, with an equal volume of suspension containing cocci and serum from the patient. The mixture is incubated at 37° C. in the opsonic incubator for half an hour and the mixture blown out and mixed upon a slide, and a film made and stained. A number of polymorphonuclear leucocytes, say 100, are counted, and the number of cocci phagocyted noted and an average struck. A parallel experi-

ment is made with leucocytes, suspension and serum of a normal dog. The results obtained from the normal dog's serum organisms and leucocytes may be taken as unity. It is usual to find that in the diseased animal the opsonic index is below normal, and if we reckon what was observed in the healthy control as 1 the patient's index on October 11 was ·4, on October 12, ·3.

In cases of follicular mange, I should like to point out that there is a temperature, due, without doubt, to the septic condition of the skin, and that we found, and find when the opsonic index is improving, that the temperature falls. After the vaccine has been injected a negative phase which is temporary succeeds and lasts a day or perhaps two, but it is followed by a rise in index, the positive phase, and it has been found in man that any vaccine injected during the negative phase is likely to do more harm than good. The dose of vaccine is regulated by the number of cocci injected and it is usual in the preparation of a vaccine to reduce the content of cocci to a suitable number, say 250,000,000 per cubic centimetre or some multiple.

On October 12, 500,000,000 cocci were injected into the subcutaneous fascia behind the left elbow, the temperature at the time being 103·4° F. On October 13 the temperature was 102° F.; the dog was lively. On October 14, it was 101·6° F., the animal in good spirits; the opsonic index had improved; the positive phase had been established. Sir Almroth Wright, to whom we owe most of our knowledge of this method of treatment, recommends that the lesions should be thoroughly soaked with a solution of 2 per cent. common salt containing ·5 per cent. citrate of potash. The object is to favour the flow through the parts of the lymph containing increased opsonins and that after the lymph has thoroughly soaked the parts that they be dusted with chalk containing 1 part of calcium chloride in 400. The animal was therefore thoroughly washed every day so far as the lesions were concerned with the above solution, and half an hour later the chalk powder was applied. The powder is to prevent escape of the opsonin-rich lymph and to produce coagulation of the lymph. I came to the conclusion, however, that the chalk powder, favouring as it did the formation of a dry scab, could be advantageously replaced by liquid paraffin, *paraffinum molle*, because the scab induced a certain amount of traction, upon parts irritation, and caused the animal to scratch. Scratching favours further infection. Later, therefore, the chalk powder was abandoned and the paraffin used. Its disadvantage is that it favours accumulation of dirt. The animal steadily improved in condition generally, the lesions improved, and the stench became

less. It is not unusual after an injection of vaccine to find a few new pustules make their appearance, but they usually abort and dry up in two days or so.

The temperature was taken daily, and I append it here :—

	°F.			°F.			°F.
Oct. 15	102·5	...	Nov. 2	102	...	Nov. 20	101
,, 16	102	...	,, 3	101·8	...	,, 21	100·5
,, 17	103	...	,, 4	101·5	...	,, 22	100·8
,, 18	102·1	...	,, 5	101	...	,, 23	101
,, 19	102·8	...	,, 6	101·6	...	,, 24	100·5
,, 20	102·8	...	,, 7	100·8	...	,, 25	101
,, 21	103·2	...	,, 8	101·4	...	,, 26	100·8
,, 22	103·4	...	,, 9	101	...	,, 27	101
,, 23	102·3	...	,, 10	101·2	...	,, 28	100·5
,, 24	102·4	...	,, 11	101	...	,, 29	101·1
,, 25	102·2	...	,, 12	101·5	...	,, 30	100·5
,, 26	102·6	...	,, 13	101·5	...	Dec. 1	100·2
,, 27	101·5	...	,, 14	101·3	...	,, 2	100·8
,, 28	102·5	...	,, 15	101	...	,, 3	100·1
,, 29	102	...	,, 16	100·4	...	,, 4	100·2
,, 30	100·5	...	,, 17	100·9	...	,, 5	101·1
,, 31	102	...	,, 18	101·6	...	,, 6	100
Nov. 1	101·5	...	,, 19	101·5	...	,, 7	100·7

On October 16 a fresh lesion appeared on the back, but, as above mentioned and as expected, it aborted. On the 18th another appeared about the shoulder towards the mid-line of the body. On the 19th the lesion aborted, and was dried up on the 21st. On the 18th 1,000,000,000 cocci were injected, and on the 25th a similar dose. Another lesion appeared on this day behind that of October 18, but it rapidly dried up and healed. The animal in the meanwhile was improving in general condition, and was in good spirits. The lesions about the head at the roots of the ears were troublesome, and the constant shaking of the head and the efforts of the animal to scratch parts caused me to change the chalk dressing for the emollient.

On November 1 the patient received a dose of 300,000,000, and on November 13 another of 1,000,000,000. On this date there were one or two small suppurating foci, and examination of the pus for demodices showed a few to be present. On November 16 an abscess formed above the nasal bones; it was the size of a hazel-nut; it was evacuated, and rapidly filled with granulations and healed. On November 22 there were only four small areas denuded of epidermis; these soon became covered, and at the end of the month the animal had completely recovered.

Since the original note was written the animal has continued to make good progress; the thickening of the skin is gradually dis-

appearing, the hair is growing; there has been no recurrence to date. He has had another dose of vaccine (1,000,000,000 cocci), prepared from another dog under treatment, on December 11 with the object of preventing any recurrence. In cases of furunculosis in man it has been observed that isolated lesions may develop some time after the patient has been declared free, and it is possible that our patient may also relapse, but up to the present (December 21) there is no sign of such.

The animal during the whole time he was in the laboratory had no other treatment than that described above. No dressings of any kind whatsoever was applied to his skin; in the words of the dresser, "He had not even carbolic soap rubbed on his skin."

The treatment has only been carried through in one patient, and I have no desire to claim that every case will be amenable to it, but I do desire to ask that it be followed where it conveniently can, and that the results be published in due course.

CONTAGIOUS VAGINITIS OF COWS.

By RICHTER.

RICHTER has treated this malady in twelve herds. Cure was considered complete when all the symptoms had disappeared, notably redness, tumefactions, and abnormal secretion of vaginal mucus. The most frequent results of contagious vaginitis are sterility, abortion, and stoppage or delay of parturition.

The twelve herds visited contained 501 animals, of which 351 were affected, or 70 per cent. Treatment was undertaken of 102 healthy subjects and of 315 affected ones. The therapy was bacillol pomade applied from four to six weeks, and 28·6 per cent. were cured.

(*Berliner Tierärztliche Wochenschrift.*)

THE WEEKLY REST OF VETERINARY SURGEONS.

THIS has been decided on by the Veterinary Society of Aube, in France. This rest shall be after mid-day on Sunday. If for an urgent case or simply by the insistence of the client it is necessary to make a visit or do any work whatever, a double charge shall be made; that is to say, a night fee. This experiment is interesting, and deserves to be followed.

(*L'Echo Vétérinaire.*)

Abstracts and Reports.

THE DRUG TREATMENT OF PIROPLASMOSIS IN CATTLE.[1]

By GEORGE H. F. NUTTALL, M.D., Ph.D., Sc.D., F.R.S.,
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AND

S. HADWEN, D.V.Sc.(McGill),
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Introduction.—In a previous paper [2] we described experiments upon the curative and preventive treatment of canine piroplasmosis by means of trypanblau and trypanrot, and briefly stated that trypanblau exerts similar effects upon the bovine parasite to those observed in the case of *Piroplasma canis*. The object of this paper is to describe in detail our experiments upon the curative treatment of bovine piroplasmosis (red water or Texas fever) by means of trypanblau.

Our experiments on redwater were rendered possible through the help of the Colonial Office and of the Board of Agriculture and Fisheries. We are much indebted to H. J. Read, Esq., C.M.G., of the Colonial Office, for the kind interest he has taken in our work, and we take this occasion to thank Messrs. Stewart Stockman, M.R.C.V.S. (Chief Veterinary Officer of the Board), James R. Jackson, M.R.C.V.S., and W. G. Wragg, M.R.C.V.S., for the very friendly help they gave us during the prosecution of our experiments in the Laboratory of the Board of Agriculture and Fisheries at Alperton, Wembley, Middlesex.

History of the Strain of P. bovis *used in these Experiments.*—We are indebted to Mr. J. R. Jackson for the following particulars regarding the strain of South African *P. bovis* used for the inoculation of the cattle upon which we experimented:—

(1) *Initial Case.* On July 9, 1904, a calf, aged 3 months, was infested with *Boophilus decoloratus* larvæ obtained from South Africa. The calf did not develop symptoms, and no *P. bovis* were found in its blood. (Sir John McFadyean's case.)

(2) *Yearling Bull* 9 was inoculated April 13, 1905, with 5 c.c. of defibrinated blood taken from the initial case. The bull developed no symptoms, but a few *P. bovis* were detected in its blood on April 22, 1905.

(3) *Heifer* 5 was inoculated on December 2, 1905, with 5 c.c. of undefibrinated blood taken from the jugular vein of Bull 9. The heifer developed fever, and *P. bovis* were detected in its blood on December 11, 1905. The heifer suffered from severe piroplasmosis, but made a slow and steady recovery.

[1] (From *Parasitology*, vol. ii., No. 3, by special permission of Professor Nuttall.)

[2] Nuttall G. H. F. and Hadwen S. (1909), "The Successful Drug Treatment of Canine Piroplasmosis, together with Observations upon the Effect of Drugs on *Piroplasma canis*," *Parasitology*, vol. ii., pp. 156-191, 1 text-figure.

(4) *Heifer* 108 was inoculated September 5, 1907, with 50 c.c. of defibrinated blood from Heifer 5. The animal developed fever, and *P. bovis* were detected in its blood on September 13, 1907; the case was a severe one, but recovery was rapid.

With a view to assuring ourselves of the virulence of the strain maintained in Heifer 108 since September, 1907, two cows were inoculated by Mr. Stockman with its blood as follows:—

(5) *Cow* X was inoculated May 22, 1909, with 30 c.c. of defibrinated blood from Heifer 108, but having failed to react the cow was reinoculated after thirteen days with 200 c.c. of defibrinated blood from Heifer 108. The cow showed parasites on the sixteenth day after the first inoculation.

Cow 5 (which received treatment) was inoculated June 3, 1909, with 200 c.c. of defibrinated blood from Heifer 108, but having failed to react by the thirteenth day, the cow was reinoculated on June 15, 1909, with 30 c.c. of jugular blood taken two hours after death from our Control Cow I.

(6) *All of our remaining cows* (Controls I.-IV., Treated Cows 1-4), eight in all, were each of them inoculaed with 30 c.c. of defibrinated blood from Cow X on June 7, 1909. As will be seen by reference to their protocols all of these animals developed piroplasmosis.

As will be seen by reference to the foregoing record, the history of the strain starts with (1) *The initial case*, which was induced by means of infected ticks. This and the succeeding case, the first due to inoculation, ran a very mild course. The cases induced by subsequent inoculations (3 and 4, &c.) were severer.

The Cattle used for our Experiments.—The animals used in our experiments were purchased in the open market. In view of the limited means at our disposal, the cattle were of inferior quality. The majority were shorthorns, two were Jerseys. Cows IV. (Control) and 4 (treated) were in poor condition at the start. Excluding Cow X, with whose blood eight of the experimental animals were inoculated, we had nine animals at our disposal for the purpose of experiment. Of these animals four served as Controls and five were subjected to treatment.

Methods of Investigation.—The cows were in all cases inoculated subcutaneously with blood from the jugular vein of animals infected with *P. bovis.* In most instances the blood had been defibrinated prior to injection. The trypanblau was prepared in saturated watery solution (cold) and injected in quantities of 130 to 200 c.c. Four of the treated cows received the drug intravenously, whilst the fifth cow was treated subcutaneously.

The rest of our technique was precisely the same as that adopted in our experiments on dogs. Consequently, we refer the reader to our previous paper (particularly to p. 161), where we describe our method of enumerating the different forms of intracorpuscular parasites as recorded in the protocols.

In the blood counts which accompany all our protocols the percentage of infected corpuscles was usually determined by counting 500 consecutive corpuscles *along the middle* of the blood film, and

noting the number which harboured parasites. Where there were fewer than two infected r.b.c. per 500 counted, we estimated the percentage of infected corpuscles by the examination of successive "fields" each containing approximately the same number of corpuscles. The percentage of each class of parasite was usually determined by counting 100 consecutive infective corpuscles and classifying them according to the types of parasites which they contained. At times we counted 200 infected corpuscles for this purpose; at other times, where few parasites were present, we had to roughly base our percentage on smaller numbers.

Observations on Untreated Cattle.

The strain of *P. bovis* we used was not nearly so virulent as that of *P. canis*. Whereas all of our control dogs died from piroplasmosis only one out of four control cows died of red water. As will be seen, only two of the untreated cows had hæmoglobinuria. In both cases the urine was very heavily charged with hæmoglobin. One of these cows died of piroplasmosis.

Notes Regarding P. bovis.

Owing to certain differences in the morphology of *P. bovis* as compared to *P. canis* we have contented ourselves with a simpler classification of the types of *P. bovis* encountered in corpuscles. We omit to classify the single intracorpuscular pyriforms (P) separately, because many oblong, ovoid, or pyriform *P. bovis* occur which represent growing forms and not parasites which have quite recently invaded the corpuscles. This is in marked contrast to what is seen in *P. canis*, where the pyriforms soon become rounded after entering corpuscles. We therefore, in the case of *P. bovis*, include all single rounded, irregular, ovoid, or pyriform parasites under the sign (O). As in *P. canis*, the (O) and double pyriform parasites (PP) predominate in respect to numbers. On the other hand, dividing forms (D) occur more frequently and in greater numbers than in *P. canis*, which indicates that the process of division lasts longer in *P. bovis* than in the dog parasite.

Observations made by one of us (G. H. F. N.) on *P. bovis* in fresh blood maintained at 37° C. certainly indicate that the bovine parasite is less active than the canine both as to movement and rate of multiplication.

The signs, used in our protocols, have the following signification:—

The sign		stands for a corpuscle containing
(O)	...	1 rounded, ovoid, pyriform, or irregular parasite.
(PP)	...	2 pyriform parasites.
(D)	...	1 dividing form.

The brackets ( ) represent the corpuscle which contains the parasites.

The abbreviation *r.b.c.* stands for red blood corpuscle.

The sign + in the protocols denotes that the number of infected r.b.c., &c., was too small to determine the percentage.

The percentage of infected corpuscles in our untreated cattle never rose to the height observed in dogs. On the other hand, whilst the highest percentage of (D) encountered in dogs was 5 to 6 per cent., these forms at times occurred in 16 per cent. of the parasitized corpuscles in cattle. The following table summarizes the observations above-mentioned:—

Cow No.	The maximum per cent. of infected r.b.c. observed	The maximum per cent. of (D) forms observed	Hæmoglobinuria + present o absent
Cow X.	0·8	4	o
Control I.	5·0	13	+ (died)
,, II.	0·06	8	o
,, III.	0·2	16	o
,, IV.	4·6	14	+

That the percentage of infected corpuscles may occasionally be large is shown by the counts we made on blood films from Heifer 182. In this case 58·2 per cent. of the corpuscles contained parasites on the day it died. This animal had hæmoglobinuria.

Owing to the fact that we have included (P) forms under class (O) the percentage of the latter is usually in excess of the (PP) forms. The percentage of (PP) forms may, however, vary in individual cows at different times, as is shown in the following table:—

	Percentage of (PP) varied between
Cow X.	52 and 36
Control I.	48 ,, 33 (died)
,, II.	43 ,, 29
,, III.	38 ,, 16
,, IV.	48 ,, 31
Heifer 182	36 ,, 19·5
And before treatment in	
Cow 1	42 ,, 33
,, 2	52 ,, 41
,, 3	53 ,, 27
,, 4	37 ,, 33
,, 5	43 ,, 30

In all the untreated cases of red water which we have studied the (PP) forms were seen, as in dogs, to persist in the blood up to the death of the animals, or else they disappeared simultaneously with the (O) forms when the parasites vanished and recovery took place.

In our untreated cows the parasites were observable microscopically in the blood for four to six days, after which they could not be detected for two to eleven days.

	Parasites found microscopically in blood-films during	After which they disappeared for
Cow X.	4 days	11 days
Control I. (died)	4 ,,	— ,,
,, II.	5 ,,	8 ,,
,, III.	6 ,,	2 ,,
,, IV.	5 ,,	8 ,,

In all of the four cows which recovered naturally the parasites reappeared in very small numbers (only found at the edge or end of stained blood-films) on one or several days, as will be seen by reference to the protocols.

Observations on Treated Cattle.

The beneficial effects or trypanblau treatment in cattle are not as striking as in dogs, because the disease in the cattle upon which we experimented was much less fatal than that in dogs. Nevertheless, the curative effect is quite evident when we observe the action of the drug upon the parasites and upon the symptoms of the disease, and compare the data relating to the treated animals with those relating to the controls.

If we accept the presence of *hæmoglobinuria* as an indication of the severity of the disease, it follows that the cases chosen for treatment chanced to be severer, taken as a whole, than the group of cases chosen to serve as controls.

The Controls.—Hæmoglobinuria was observed in two out of the four controls; in Control Cow I. it followed twenty-four hours after the appearance of parasites, lasted three days and persisted until death; in Control Cow IV. hæmoglobinuria followed forty-eight hours after the appearance of the parasites and persisted for five days. In both cases hæmoglobinuria was severe. It is worthy of note that one of these two cows which had hæmoglobinuria died from piroplasmosis.

The Treated Animals.—All of the five treated animals had hæmoglobinuria, but recovered. In four the hæmoglobinuria appeared on the day the animal was treated, but before the injection of the drug. In one cow (No. 1) hæmoglobinuria was first noted twenty-four hours after treatment. The hæmoglobinuria was severe in Cows 3 and 4, marked in Cows 1 and 5, slight in Cow 2.

Hæmoglobinuria was noted in		Hæmoglobinuria lasted
Cow 1	48 hours after the parasites appeared	24 hours
,, 2	42 ,, ,, ,, ,,	1 day
,, 3	22 ,, ,, ,, ,,	5 days
,, 4	when the parasites were first found	36 hours
,, 5	49 hours after the parasites appeared	48 ,,

To repeat: Whereas one of the two controls which had hæmoglobinuria died of piroplasmosis, all of the five treated animals recovered, although they had hæmoglobinuria. In the untreated cows hæmoglobinuria lasted in one case three days, when the animal died; in the other case five days, when the animal recovered. In only one treated cow (3) did the hæmoglobinuria last five days; in the others it lasted only twelve, twenty-four, thirty-six, and forty-eight hours respectively.

The Effects of Trypanblau upon the Parasites.—The most striking proof of the efficacy of the drug is, however, afforded by the obvious effect it exerts upon the parasites. Exactly as in *P. canis*, the (D) forms are the first to disappear, then the (PP) forms, only the rounded or irregular forms (O) persisting for a time, whilst the percentage of infected r.b.c. falls rapidly. The effects of trypanblau are clearly set out in the following tables. Cow 5 received the drug subcutaneously, which accounts for the slower effect exerted upon the parasites.

Blood Examination before Treatment.

Cow	Maximum percentage of infected r.b.c.	Maximum percentage of (D) forms
1	0·8	8
2	1·0	8
3	1·0	11
4	0·6	3
5	1·5	6

N.B.—In none of the treated animals did the number of infected corpuscles exceed 1·5 per cent. In two out of four controls no less than 4·6 per cent and 5 per cent. of infected r.b.c. are recorded. In only one of the treated cows did the number of (D) forms attain 11 per cent. In three out of four controls, 13 per cent., 14 per cent., and 16 per cent. of (D) forms were recorded. These differences are attributable to the treatment.

TABLE SHOWING THE EFFECT OF THE DRUG IN REDUCING THE PERCENTAGE OF INFECTED CORPUSCLES WITHIN 4½ TO 8 HOURS AFTER TREATMENT AND CAUSING THE DISAPPEARANCE OF (PP) AND (D) FORMS.

Treated Cow No.	Showing effect of drug after stated time had elapsed	Percentage of infected r.b.c. At time when drug was given	Percentage of infected r.b.c. After drug was given	Percentage of (PP) forms At time when drug was given	Percentage of (PP) forms After drug was given	Percentage of (D) forms At time when drug was given	Percentage of (D) forms After drug was given
1	4½ hours	0·8	·01	33	1	4	0
2	8 ,,	1·0	·03	41	1	8	0
3	4¾ ,,	0·6	·06	44	2	5	0
4	4½ ,,	0·6	·03	33	3	2	0
5*	7 ,,	1·5	·02	33·5	5·5	4	1

* This case was treated by subcutaneous injection. The effect of the drug is obviously less rapid.

After the periods of time noted in the above table, the blood was repeatedly examined for parasites. The results of these examinations are summarized in the following table.

TABLE SHOWING THE TIME WHEN THE COWS WERE TREATED AFTER THE PARASITES HAD FIRST BEEN FOUND, THE TIME WHICH ELAPSED BETWEEN THE INJECTION OF THE DRUG AND THE DISAPPEARANCE OF THE PARASITES, AND THE TIME WHEN THE PARASITES REAPPEARED AFTER THEIR FIRST DISAPPEARANCE.

Treated Cow No.	Time in days when cow was treated after parasites appeared	Time it took the parasites to disappear after drug was injected	Time when parasites reappeared
1	1 day	– 24 hours *	Blood negative for 18 days.
2	2 days	– 45 ,,	,, ,, ,, 16 ,,
3	1 day	– 24 ,,	,, ,, ,, 6 ,, Very few parasites found later, none on some days.
4	Same day	9 ,,	Blood negative for 5 days, 1 parasite found 6th day, none later.
5	2 days	– 45 ,,	Blood negative for 6 days, when observation ceased.

* The – signs before the numbers denote that the parasites may have disappeared some hours earlier than is recorded.

NOTE.—As will be seen by reference the parasites were found microscopically in the blood of the Control Cows during 4 to 6 days. The parasites reappeared after 2 days in one case, after 8 days in two cases, after 11 days in one case.

Judging from the facts above recorded, it appears certain that some of these cows would have died but for the treatment they received.

Note regarding Degenerative Changes in the Parasites.

The single parasites contained in infected corpuscles showed evidence of degeneration, as described in *P. canis*, in consequence of the treatment. When these single parasites were grouped according to their size into "large" and "small" we observed the following changes in their relative numbers as the result of treatment. (Examination of stained films from Cow 1):—

At 12.30 p.m., just before treatment there were	66%	large and	34%	small parasites.
,, 2.45 p.m., after ,, ,,	35%	,,	65%	,, ,,
,, 4.45 p.m., ,, ,, ,,	36%	,,	64%	,, ,,

After treatment, the large intracorpuscular parasites stained *faintly* in contrast to the small parasites, which stain intensely. At the same time a number of conjoined pairs of free pyriform parasites were observable, which stained faintly, and single degenerated pyriforms could be occasionally encountered.

SUMMARY AND CONCLUSIONS.

(1) Trypanblau promises to be an efficient remedy for bovine piroplasmosis, since it exerts a direct and obvious effect upon the parasites.

(2) The effect of the drug upon *P. bovis* is similar to that which it produces upon the canine parasite. The dividing forms are the first to disappear, and after a few hours the pyriform parasites also disappear from the peripheral circulation; the parasites which are detected in the blood after a few hours appear degenerated and rounded or irregular; within nine to forty-five hours or less all the parasites have disappeared from the blood.

(3) As in canine piroplasmosis the disappearance of the parasites from the blood may be temporary. The parasites also disappear and reappear in small numbers (after two to eleven days) in animals undergoing natural recovery. In three treated animals the parasites reappeared in exceedingly small numbers after five to six days; in two they had not reappeared after sixteen and eighteen days respectively. The animals show no symptoms and progress towards recovery.

(4) It remains to be determined (1) how long the blood of treated cows may contain parasites after the apparent recovery; (2) if the parasites in such recovered animals are altered in virulence; (3) if the parasites are capable of infecting ticks.

(5) The experiments were conducted on nine cows, of which four served as controls and five were treated with trypanblau. Of the controls two suffered from hæmoglobinuria, and one of these died of piroplasmosis; the two other controls had no hæmoglobinuria and were very mild cases. All of the treated cows had hæmoglobinuria and recovered. In four of the treated cows hæmoglobinuria occurred before treatment began.

(6) As might be expected, the drug exerts a more rapid effect when injected intravenously. The parasites disappear more slowly after subcutaneous injection of the drug. (Judging from our recent experiments on dogs, the giving of the drug *per os* promises to be without effect. See *Parasitology*, p. 231.)

(7) Although doses of 150 to 200 c.c. of a saturated watery solution of the dye were used, it is probable that smaller doses will prove efficient. The drug appears to produce no ill-effects upon cattle.

(8) The drug, being a dye, has the disadvantage of colouring the tissues, more especially the subcutaneous connective tissues. How long the colouration persists remains to be determined. In any case this disadvantage can scarcely weigh in the balance as against saving the life of the animal, especially when used for breeding purposes.

(9) We hope that experiments, which are about to be conducted in the field in Africa and elsewhere, will demonstrate the value of the remedy in practice.

(10) Trypanblau and similar drugs should be given a trial in the treatment of carçeag in sheep and biliary fever in horses.

Note regarding the Solubility of Trypanblau.

In the course of our experiments we noted that crystals of trypanblau were frequently deposited after a short time even in 1 per cent. solutions of the dye prepared with distilled water at room temperature. We therefore communicated with the manufacturers who had supplied

us with the dye, Farbwerke vorm. Meister Lucius und Brüning, Hoechst a/M., desiring information regarding the solubility of trypanblau in distilled water. In a letter, dated August 3, 1909, from the manufacturers, the latter state that they have made many experiments in this direction, with the following results:—

One hundred cubic centimetres boiling water will dissolve 2 grm. of trypanblau and the solution can be easily filtered. On the other hand, 5 grm. of the dye will not easily dissolve in 100 c.c. of boiling water and the solution filters badly, part of the dissolved dye separating in the filter; on cooling, the solution forms a gelatinous mass. The 2 per cent. solution, after standing for twenty-four hours, has for the most part solidified into a gelatinous mass. In the case of 1 per cent. solutions only a very small amount of the dye separates out after the lapse of twenty-four hours. A ½ per cent. solution remains quite clear after standing for a long time. Owing to the difficulty of obtaining solutions of the dye, and the tendency of the solutions to gelatinize on standing, it appears advisable to prepare the solutions immediately before use, in which case a 2 per cent. solution at blood temperature could be used.

As stated we prepared our solutions in the cold, the dye being added in the proportion of 1 to 1·5 per cent. to distilled water. Our solutions did not gelatinize, and there was always a certain amount of dye deposited. The deposit was fine and was mostly taken up in the syringe and injected with the solution. From a practical standpoint the 1 per cent. solution appears to suffice, and further experience may show that ½ per cent. solutions are sufficiently effective.

G. H. F. N.

Miscellaneous.

UNIVERSITY OF LONDON.

Intermediate Examination in Veterinary Science (Part II.), for External Students.

Pass List, 1909.

1801. Graves, Thomas Chivers, M.R.C.V.S., Royal Veterinary College.
1802. Sheather, Alfred Leslie, M.R.C.V.S., Private study.

Examiner: Veterinary Physiology: Professor W. D. Halliburton, M.D., LL.D., B.Sc., F.R.S.

B.Sc. Examination in Veterinary Science for External Students.

Pass List, 1909.

1901. Andrews, William Horner, M.R.C.V.S., Royal Veterinary College. Institut Pasteur, Paris, and Ecole Vétérinaire, Alfort.

Examiners: Veterinary Hygiene: S. Stockman, Esq., M.R.C.V.S.; Veterinary Pathology: W. Bulloch, Esq., M.D., C.M.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Examinations in London.

At a meeting of the Board of Examiners held in London on December 13, 1909, for the written, and on and between December 17 and 20 inclusive for the oral and practical examinations, the following passed their final examination and were admitted members of the Royal College of Veterinary Surgeons:—

Mr. T. A. B. Cocksedge
,, V. S. M. Cope
,, A. A. Comerford
,, V. Franklin
,, J. P. Hamilton
,, W. D. John
Mr. F. O. Maynard
,, J. A. McMenamin
,, V. Pride Jones
,, W. Sewell
,, P. R. A. Thrale
,, P. R. Thompson

The following passed their third examination:—

Mr. J. A. G. Gosling
,, S. G. M. Hickey *
,, S. C. Rowbotham
Mr. G. A. Roberts *
,, R. Wooff *
,, R. Wynne Williams

The following passed their second examination:—

Mr. F. G. Buxton
,, R. T. Davis
,, T. Herratt
,, E. J. Lainé *
Mr. W. F. Poulton
,, S. H. L. Woods
,, B. M. R. West *

The following passed their first examination:—

Mr. C. E. W. Bryan
,, C. J. R. Lawrence *
,, W. E. Petty *
,, R. J. Stow
Mr. S. L. Slocock *
,, J. S. Watson
,, H. B. Williams

Marked thus * passed with Second Class Honours.

Examinations in Dublin.

At a meeting of the Board of Examiners held in Dublin on December 13, 1909, for the written, and on December 14 for the oral and practical examinations, the following passed their final examination:—

Mr. C. Armstrong
,, J. A. Gibbons
,, M. F. O'Sullivan
,, H. G. Tabuteau-Herrick
Mr. T. G. S. Bogue
,, J. Dodd
,, W. T. Ferguson
,, J. Fox

The following passed their third examination:—

Mr. C. H. Bryans
,, P. A. Carroll
,, M. Cunningham
,, E. Wilson
,, T. Doyle
,, C. A. Kelly
Mr. P. F. McCormack
,, T. L. Revington
,, F. Roche
,, J. A. Smith
,, F. J. Weir *

The following passed their second examination:—

Mr. R. Burriss
,, J. Evans
,, V. Fox
,, T. H. Kellett
,, C. E. McCrea
,, R. Marner
,, W. J. O'Donoghue *
Mr. A. E. O'Neill
,, C. J. Ryan
,, W. P. Walsh
,, R. P. Byrne
,, J. R. Jackson
,, L. C. Maguire
,, L. J. Kelly

The following passed their first examination :—

Mr. T. J. Carroll *
,, S. Flood *
,, L. A. Herbert
,, P. D. Huston
Mr. J. Shannon
,, A. E. Brandon
,, E. S. Morgan

Marked thus * passed with Second Class Honours.

EXAMINATIONS IN LIVERPOOL.

At a meeting of the Board of Examiners held in Liverpool on December 13, 1909, for the written, and on and between December 16 and 20 inclusive for the oral and practical examinations, the following have passed their final examination :—

Mr. C. L. O'Gorman
Mr. E. Morgan

The following passed their third examination :—

Mr. P. McGregor
,, F. J. Richmond
Mr. E. L. Butters *

The following passed their second examination :—

Mr. W. Atkinson
,, H. D. Lewis
,, W. Andrews *
Mr. A. L. Pollard
,, J. L. Williams

The following passed their first examination :—

Mr. A. P. Gately
Mr. R. Daubney

Marked thus * passed with Second Class Honours.

EXAMINATIONS IN GLASGOW.

At a meeting of the Board of Examiners, held on December 13, 1909, for the written, and on December 15 and 16 inclusive for the oral and practical examinations, the following passed their final examination :—

Mr. M. Mackay
,, J. F. Taylor
Mr. J. J. O'Brien

The following passed their third examination :—

Mr. J. Dunlop
,, H. M. Johnston
,, W. Anderson
Mr. J. S. Moncrieff
,, W. S. Inglis

The following passed the second examination :—

Mr. W. Macfarlane.

The following passed their first examination :—

Mr. E. F. Angler
,, W. Barr
Mr. R. B. Crichton

EXAMINATIONS IN EDINBURGH.

At a meeting of the Board of Examiners, held on December 13, 1909, for the written, and on and between December 15 and 18

inclusive for the oral and practical Examinations, the following passed their final examination :—

Mr. J. Anderson
„ W. Davies
„ J. Macfarlane
„ E. J. Nicholson
Mr. F. H. Sanderson
„ J. J. Soutar
„ J. Waddell
„ W. Walker

The following passed their third examination :—

Mr. W. Aitken
„ H. Allison
„ J. L. Cormack
„ S. C. Currie
„ J. R. Greig
Mr. J. B. Idle
„ W. S. Lornie
„ W. J. McKenzie
„ P. B. Riley

The following passed their second examination :—

Mr. F. J. L. Croudace
Mr. W. Dalling *

The following passed their first examination :—

Mr. R. E. Drennan
„ J. B. Russell
„ D. R. Williamson
Mr. W. K. Denham
„ E. Sewell
„ E. S. Holmes *

Marked thus * passed with Second Class Honours.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Fellowship Degree.

A meeting of the Board of Examiners for this Degree was held on December 11, 1909, at 10, Red Lion Square. Eight candidates entered for the examination, and the undermentioned gentlemen passed and obtained the diploma :—

Candidates	Title of thesis
Bennett, R. ...	... "Anthrax."
Trigger, Wm. ...	... "Laminitis."
Amos, S. T. ...	... "East Coast Fever."
Runciman, T., jun.	... "Joint Evil in Foals."
Moody, W. J. ...	... "Phosphorus and Arsenic Poisoning in Herbivora."

The examiners were Messrs. J. Malcolm, W. Hunting, and Professor Macqueen, Mr. W. J. Mulvey being in the chair.

THE ROYAL SANITARY INSTITUTE.

At the examination held on December 10 and 11, 1909, thirty-six candidates presented themselves, and sixteen were granted certificates, including :—

Mr. J. B. Buxton, M.R.C.V.S.
„ G. W. Dunkin, M.R.C.V.S.
„ B. H. Mellon, M.R.C.V.S.

Translations.

A CASE OF FLAT EPITHELIAL CANCER ON THE LOWER JAW OF A HORSE.

By Chief Veterinary-Surgeon JAHNICHEN.

Hitherto it has generally been accepted that carnivora frequently suffer from cancer and herbivora not at all, but this view in recent times has been shown to be erroneous. It has been found that plant-eaters suffer from carcinoma (more frequently from sarcoma), and that old or adult animals are generally affected. The occurrence of carcinoma as affecting the horse is shown by the accompanying statistical information.

According to Schütz from observations published in the year 1902, among 126,776 (in a period of twelve years) horses examined fifty-eight cases of cancer were found. Consequently in each 10,000 horses there were about four cases of cancer. Of these fifty-eight discovered cases forty-eight involved the skin, seven the vagina and uterus, and three the large cavities of the head. In eighteen years 3,877 horses were examined *post-mortem*, of which six were found to have carcinoma. In literature from a hasty compilation 245 cases of cancer have been recorded. In the apportionment of primary cancer eighty-six of these involved the skin, sixty-five the urino-genital organs, twenty-five the digestive apparatus, and sixty-nine the respiratory tract.

Fröhner in the course of a year operated on forty-seven horses for tumours; of these, three were carcinomatous, and Johne found twenty-eight cancers in 128 horses operated on for tumours.

At the Pathological Institute of the Veterinary College at Dresden, five cases of carcinoma affecting the head of the horse have been noted in the last ten years. Sixteen carcinomas have been met with in the clinic of the Veterinary College in Berlin in fifteen years—five of the nasal cavities, eight of the upper jaw, and three of the brain and nasal cavities. The cavities of the jaw, the conjunctivæ, and the lymphatic glands are the favourite places of attack.

Casper found three cases of cancer of the upper jaw, Frohner records two cases of flat epithelial cancer of the upper jaw, an alveolus being attacked in one case and the hard palate in the other. Poppe describes two cases of flat epithelial cancer of the third eyelid of the horse, and Fröhner and Möller mention such cases. Hinrichsen encountered a case of primary cancerous growth (carcinoma medullare) of the lymphatic glands of the head, with metastatic extension into the liver and kidneys. Dammaun saw a flat epithelial carcinoma affecting the gums and upper incisors of a horse aged 15.

I can find no record of the occurrence of the neoplasm involving the lower jaw of a horse, but the following case which I encountered is undoubtedly one:—

At the beginning of January I was called to a horse which had eaten badly for fourteen days. He was a big, bony, saddle horse, aged 14. He stood with sunken head, his food half eaten, and saliva sodden; he had a listless gait and long staring coat. On the right side of the larynx there was an uneven—not painful and not hot—swelling of cartilaginous consistence, and from a fistula canal about

3 cm. deep, surrounded by wall-like granulations, a yellow, creamy, evil-smelling pus escaped. Neither the swelling nor skin over it was moveable. The right masseter was œdematous, but not painful on pressure. There was an evil-smelling discharge from the right nostril. There was no abnormal smell of the breath. Water was taken freely, but food taken into the mouth could not be swallowed. The mouth could only be opened about three fingersbreadth, and a bad smell similar to that from carious teeth issued from it. Treatment was purely symptomatic. In the course of the following week on the right and left of the larynx and extending into the masseter about twenty different large abscesses formed, from which yellowish clear tenacious pus and dark sanguineous fluid escaped.

Guinea-pigs inoculated with some of this fluid died of catarrh of the stomach after six weeks, but showed no changes either at the inoculation place or in the internal organs. Agglutination tests for glanders gave no result. The horse gradually sank to a skeleton, and died on February 3.

Post-mortem.—Badly nourished cadaver. Rigor mortis not general. In the œsophagus and on the right cheek irregular, torn, and discoloured granulations. Spleen enlarged and pulp very dark red; kidneys full of blood; liver enlarged and rounded edges, on the anterior surface of the liver capsule, hard sinewy appendages and greyish-white opague spots as large as a mark piece. On the gums at the dorsal edge of the right lower jaw behind the third molar there was a prominent, knotty, new formation, as big as a hen's egg, of soft consistence and dirty greyish blue colour. Its surface was covered with smeary, necrotic, bad-smelling masses. The roots of the tumour had grown through the whole of the under jaw and broken through its ventral edge. The submaxillary glands were enlarged, and their cut surface showed speckly-grey points and large and small cavities filled with pus. Further, metastasis could not be found. No anomalies of the teeth. The tumour, examined by Dr. Joest, of the Dresden College, was pronounced to be a typical flat epithelial carcinoma, with sarcoma tissue between the cancer cell nests—a so-called carcinoma sarcomatodes.

(*Zeitschrift für Veterinärkunde.*)

A CASE OF ARSENIC POISONING IN THE DOG.

By Sub-Veterinary-Surgeon Dr. ROELCKE.

At the beginning of April a fox-terrier was brought to me by his owner, who said he had picked up an unknown quantity of white powder which had been strewn about the house as a mouse poison, but according to the sellers this powder was quite harmless to men and animals. The dog had become very restless on the evening of the preceding day and made violent attempts at vomiting and foamed at the mouth. After some time he was quieter, sought out his usual resting-place, laid down and seemed much better. Early the following morning, as the dog could not get up the owner called in the veterinary surgeon.

Examination showed 130 pulse-beats a minute, weak impact of the heart, cold extremities, dirty red coloration of the visible mucous membranes. Breathing 35 to the minute and laboured. Diarrhœa not present; pupils dilated. The animal lay listlessly and would not get up or raise himself on his forelegs.

The suspected powder contained plainly visible porcelain-like scales which were mixed with powdered sugar. By heating the substance in question with potassium acetate the characteristic smell was given off.

The diagnosis from clinical and chemical examination was one of arsenic poisoning. The treatment consisted of *antidotum arsenici*, a teaspoonful every four hours. In the course of twenty-four hours the dog completely recovered.

(*Zeitschrift für Veterinärkuude.*)

CHONDROMA OF THE HUMERUS IN A COW.

By M. EISENMENGER.

Veterinary Surgeon in 12th Chasseurs.

NORMANDY cow, aged 8, presented at the abattoir of Pont sur Meuse for sanitary inspection. This cow presented at the level of the left shoulder an oval, painless, hard, sessile tumour, whose large axis was directed from above to below. The skin covering it was not thickened, and was free from any lesion.

The tumour reached from the upper third of the scapula to the middle of the humerus, and from the articulation of the shoulder to 4 or 5 cm. behind the posterior border of the scapula. It occasioned no inconvenience in walking.

At the autopsy the neoplasm is surrounded by thickened conjunctive tissue. The supra and sub-spinous muscles were easily isolated from it, and it was only separated from the articular scapulo-humeral capsule by layers of connective tissue. It was firmly fixed to the deltoid cavity of the humerus with which it was incorporated. The tumour is of cartilaginous nature, and is formed by little nuclei of cartilage, situated in the middle of the conjunctive network; this tissue becomes denser in proportion as it approaches the humerus, and little by little is transformed into bone towards the point of its attachment.

The vertical axis of the tumour measures 43 cm., the antero-posterior measures 36 cm. The weight is 9 kgram. 365 grm.

This chondroma appears to be of traumatic origin. A kick or a thrust with a horn received at the level of the deltoid cavity of the humerus has inflamed the periosteum (the skin had not been injured); cartilage was formed in abundance by the inflamed bone, and little by little this new tissue had a tendency to change into bone. At a relatively near time the chondroma would have become an osteoma. This case is interesting on account of its rarity, and the large size of the tumour.

(*Revue Générale de Médecine Vétérinaire.*)

Medicinal Preparations.

FIBROLYSIN AND TANNOFORM.

We have received from Mr. E. Merck samples of tannoform and fibrolysin for purposes of trial. The fibrolysin is a clear, colourless solution put up in neat sterile glass ampullæ. It is a soluble substitute for thiosinamine, and it is stated that it can be used without ill-effects either subcutaneously, intramuscularly, or intravenously. It is claimed for it that it permanently reduces inflammatory fibrous tissue, and is consequently indicated in such cases as strictures, fibrous tumours, and fibrous adhesions of serous membranes. We have not yet been able to give the agent a satisfactory test, but we hope to do so in the near future, and to communicate the result.

Tannoform, on the other hand, is an agent with which we are already familiar. It is a light reddish-white powder, odourless and almost tasteless, insoluble in water, but soluble in alcohol. It is a condensation product of tannic acid and formaldehyde, and combines to some extent the action of both those drugs. We have had very good results from its use externally as a dusting powder for superficial wounds in various species of patients, and for moist eczema in dogs. We have also had excellent results from its internal use in canine practice in the treatment of various forms of diarrhœa, including the abdominal form of distemper, in doses of gr. v. three times daily, administered as a powder.

Books and Periodicals, &c., Received.

The Englishman; Journal of the Incorporated Society for the Destruction of Vermin; Report of the Principal Veterinary Surgeon and Bacteriologist for Queensland; Bureau of Animal Industry, U.S.A.; Bulletin of the Sleeping Sickness Bureau; The Strange Story of the Dunmow Flitch (D. Carter, Dunmow); Bacon Curing in Essex (L. M. Douglas); London University Gazette.

Letters and Communications, &c.

Professor Mettam; Mr. S. Dodd; Mr. L. M. Douglas; Mr. T. Runciman; Mr. Merck; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Mr. F. O. L. Walpole.

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the Journal should be addressed to the publishers, Messrs. Bailliere, Tindall and Cox.

THE LATE ALBERT WHEATLEY, F.R.C.V.S.

THE

VETERINARY JOURNAL

FEBRUARY, 1910.

THE LATE MR. ALBERT WHEATLEY, F.R.C.V.S.

It was with sincere regret that we previously announced, in our December issue, the death of our esteemed friend Mr. Albert Wheatley, of Reading, in his fifty-sixth year. Mr. Wheatley was born, as it were, into the veterinary profession, his father being a veterinary practitioner in Reading. Mr. Albert Wheatley took his diploma at the Royal Veterinary College, London, in 1876, and was at once taken into partnership by his father. He was extremely successful as a practitioner, and soon obtained the full confidence of his father's *clientèle*. He took his Fellowship Degree in 1885. He then looked for a larger field for his energies, and was twice President of the Royal Counties Veterinary Medical Association. He was elected to the Council of the Royal College of Veterinary Surgeons in 1891. He retired from that body after three years, and later, in 1901, he was elected Examiner for the Class B Examination of the Royal College of Veterinary Surgeons in the subjects of Stable Management and the Principles of Shoeing, which appointment he retained until his death. Mr. Wheatley had specialized in the subject of the shoeing of horses, and, in collaboration with Mr. Dollar, he produced our best standard work on the subject, entitled "On the Foot of the Horse, and Shoeing." He officiated as judge at shoeing competitions in many parts of the country, and at various times he acted as veterinary surgeon at the horse shows at Islington held by the Hunters' Improvement Society, the Shire Horse Society, and the Hackney Society.

Mr. Wheatley will be much missed by the members of his profession in the South of England and by the teachers at the veterinary colleges, while the examination candidates have lost a kind, sympathetic, and just friend.

Editorials.

THE CAUSES OF COLIC IN HORSES.

GENERAL SMITH has given us much to think about on the above subject in his last annual report, a portion of which we reproduce in this issue. He has had nearly eight hundred non-fatal cases of colic and almost a hundred fatal cases during the year on which to form his opinions, and his statistics are highly instructive. For example, he has been able to show that, in army horses at any rate, colic is much more prevalent during one portion of the day than the other, namely, from 5 a.m. to 9 p.m., and that the worst time of all is between 4 p.m. and 6 p.m. He then considers what circumstances occur during the "colic day" which may be concerned in the production of the colic. Undoubtedly the main events during that period are watering, feeding, and working, all events which are not connected with the non-colic day of from 9 p.m. to 5 a.m. Those three factors are then investigated. In General Smith's own words, "the irresistible conclusion from the observations is that watering exercises an enormous influence over the production of colic and atal disorders of the stomach and intestines." In fact, over 80 per cent. of the non-fatal cases and about 70 per cent. of the fatal cases occurred after watering. Then as to the influence of work, 76 per cent. of the fatal cases and of the non-fatal cases had been at work on the day of the attack. The similarity of the percentages associated with watering and with work is really very striking, and to us it is significant. It would certainly suggest to us that there is a direct connection between the combination of the two events and the onset of colic.

It would certainly support our opinion that colic is frequently due to allowing horses to take copious draughts of cold water when coming in from work in a more or less exhausted condition. In support of that opinion is the fact that most cases occurred after the horses were brought in from work (not during

work), and during the period of manœuvres, *i.e.*, when exhaustion would be greater. On the other hand, our experience in the hunting districts of Cheshire and Leicestershire is that colic is not very common amongst hunters (unfortunately we have no figures to go upon), and horses coming home very exhausted after their day's work, and this we attribute to the custom of withholding cold water and giving warm oatmeal gruel instead.

There is one other rather important probable cause of colic to which no reference has been made, viz., entozoa. It would have been both interesting and instructive if the number of fatal cases had been noted in which intestinal parasites were observed on *post-mortem* examination. In the list of deaths we observe only one case in which death was attributed to entozoa, though fifty horses were treated for the presence of these pests.

It is practically impossible to say how many non-fatal cases are complicated with or caused by worms, but we are of opinion that the number is far from insignificant, especially when one realizes the vicious nature of the sclerostomes and the sometimes enormous number of ascarides present.

General Smith concludes with advice which is excellent, and which if followed would, we are sure, considerably reduce the number of cases of colic. He says: "The colic of work may yet be shown to be due to the intervals of feeding being too great, or to the large amount of water consumed. During a long march or a long day's operations horses should be watered as frequently as possible, and fed, if for only five or ten minutes at a time." In this way a horse will be enabled to get his food distributed throughout the day, and not, as so often is the case, be kept short during the day and be expected to make up for it at night with impunity. The anatomy of the digestive apparatus of the horse and his natural habit of almost continuous feeding are sufficiently strong arguments to show the reasonableness of the advice to "feed little and often."

THE INDIAN CIVIL VETERINARY DEPARTMENT.

THE Imperial Bacteriologist to the Government of India (Captain J. D. E. Holmes, D.Sc., M.R.C.V.S.) has just issued the first scientific memoir of the Indian Civil Veterinary Department. It is a very excellent report of the research work done in the Imperial Bacteriological Laboratory for 1908-09, and we give an instructive abstract elsewhere in this issue. Previous reports have been limited to a short statement of the administration of the institute, the amount of sera and vaccines prepared, and a mere mention of the diseases under investigation. The main object of the Laboratory is primarily to supply sera and vaccines to the Civil Veterinary Department for the treatment and control of infective diseases of animals throughout India; and, secondly, to investigate diseases of animals. There is no doubt that the results for the first purpose have been eminently satisfactory, as may, perhaps, be judged from the fact that nearly three-quarters of a million doses were issued from the Laboratory during the year. As might be expected, the enormous amount of work entailed has been a tax on the staff, and has left comparatively little time for research work. There are many diseases in India of which we know very little, and work concerning them must be done on the spot. It is therefore a great pity that the staff of this Laboratory should be short-handed. The Director should be free from routine work beyond merely superintending it—such work can well be carried on by capable assistants—and he should be free to devote most of his time to research. That such a policy would pay is clearly shown by the results obtained even under existing difficulties. After reading the abstract on pages 108-109 we are sure our readers will agree with us that the Indian Civil Veterinary Department is working on excellent lines and doing much to improve and increase the value of the animal population of that vast Empire.

General Articles.

COLIC AND DISEASES OF THE DIGESTIVE SYSTEM.[1]

By GENERAL FRED SMITH, D.S.O.,

Director-General of the Army Veterinary Service.

In the last Annual Report prominence was given to the important subject of colic and fatal disorders of the digestive system. During the year which has since elapsed every effort has been made to enquire into the causes operating in the production of this peculiar class of affection, the existence of which amongst animals is almost entirely confined to the horse.

A system of collective investigation has been adopted, every case of colic or fatal disease of the digestive system being separately reported upon, and a series of questions answered. The result of these enquiries is now presented.

Speaking broadly, diseases of the digestive canal of the horse are generally spoken of as colic. Colic, as a matter of fact, is only a symptom of abdominal pain; it is present whether the affection is a simple cramp of the bowels, or whether the lesion is of a fatal character, such as a rupture of the intestine. It is owing to this fact that the layman gets confused in the use of a term which sometimes indicates a mild, at other times a fatal, condition.

In these returns the term "colic" is restricted to cases of bowel or stomach pain which recovered. All cases which died, no matter whether from inflammation, rupture, twist, or impaction, are spoken of simply as fatal disorders of the digestive canal; in this way without sacrificing accuracy we ensure simplicity.

One-third of all the deaths in the army, and over 4½ per cent. of the admissions to hospital for the year, were caused by the above disorders, and day by day there were never less than seventy horses under treatment for these affections. In the presence of these facts the importance of a searching enquiry into the causes needs no further comment.

During the year under review there occurred 777 cases of colic, and ninety-two fatal disorders of the digestive canal. The percentage of colic on the average strength of horses was less than last year, but is still too high. Here are the figures for the last four years:—

1905	...	3·37 per cent. of strength.
1906	...	3·79 " "
1907	...	4·35 " "
1908	...	3·72 " "

These figures do not include any fatal cases.

[1] From his Annual Report.

The distribution of colic by commands was as follows :—

	Colic only. Per cent. of average strength.	Colic and Fatal Disorders. Per cent. of average strength.
Scottish Command ...	9·59 ...	10·46
Aldershot Command ...	4·62 ...	5·16
Irish Command ...	4·34 ..	4·75
Eastern Command ...	4·14 ...	4·46
Southern Command ...	3·53 ...	3·94
London District ...	2·96 ..	3·72
Northern Command ...	2·85 ...	3·19
Western Command ...	1·70 ...	1·70

In this table the great excess of colic in the Scottish Command is very striking. Making every allowance for the error arising from the use of small numbers, it is still evident that these diseases exist in a far higher proportion than should be. Every tenth horse in the Scottish Command was admitted during the year. Further, the proportion of fatal cases was the highest in the Army. The Aldershot Command has about half the admission and death ratio of the Scottish Command; the Irish, Eastern, and Southern Commands follow; the London District furnishes a low admission rate, but a death rate the second highest in the Army.

If the colic and fatal diseases of the digestive system be examined by branches of the Service, the following table is obtained :—

	Colic.	Fatal Disorders.
Mounted Infantry ...	·46 per cent.	·23 per cent.
Household Cavalry ...	1·13 ,,	·88 ,,
Royal Horse Artillery ...	3·30 ,,	·13 ,,
,, Engineers ...	3·93 ,,	·79 ,,
,, Field Artillery ...	5 21 ,,	·45 ,,
Army Service Corps ...	8·07 ,,	·89 ,,

The low colic percentage of the Mounted Infantry is a point of importance, and the question suggests itself whether cobs are so liable as horses. It certainly appears that draught horses are more liable than riding horses, but this point can only be decided by extended enquiry.

The monthly prevalence of colic has been studied, and though considerable variation occurs from month to month, yet July stands out as the worst month of the year. If the year be divided into six warm months, April to September, and six cold months, October to March, it is found that more cases of colic occur during the warm than during the cold months. The seasonal influence is, however, much more marked in the incidence of fatal cases; there are more fatal cases during the summer, July and September furnishing the two months of highest mortality.

The explanation of the higher admission and mortality rate in summer is that colic and fatal disorders of the digestive system are not entirely brought about by water or food, but that work is a factor. To this point we shall return.

For years it has been known that colic is more frequent at certain hours of the day; in consequence the influence of the time of day in the production of colic has been carefully observed in the whole of the 777 colic cases and ninety-two fatal cases of disease of the digestive system recorded during the year. These results are of the greatest practical importance; they demonstrate in the daily life of the horse what may be described as a colic storm, which lasts sixteen hours. This begins at 5 a.m. and ends at 9 p.m., the height of the tempest being reached between 4 p.m. and 6 p.m. The disturbance snbsides at 9 p.m., and from then until 5 o'clock next morning there is comparative calm, lasting eight hours. Thus, there is in the life of horses a colic day of sixteen hours. The cause of this we must now attempt to arrive at.

The events of the colic day which alone can have any influence in the production of the disease are water, food, and work; the events of the non-colic day (night) are rest, and practically no food. Evidently water, food, and work are far more concerned in colic production than rest and abstinence.

The water a horse drinks does not stop in the stomach, for the latter is so small it could not contain it; the fluid as it is drunk passes in at one end of the stomach and out at the other, and travels to a special receptacle by means of a tube 72 ft. in length; this tube is the small intestine, and the water takes from five to fifteen minutes to travel its whole length, while it takes food at least five hours to travel the same distance.

A thirsty horse may drink as much as 3 or 4 gallons of water, and this mass sweeps through the stomach and small intestines, in the latter carrying in its rush everything before it.

With the above fact before us, it becomes an important point to determine the proportion of colic cases which occur before and after watering. This is shown in the following table:—

	Attacked before watering.	Attacked after watering.
Colic cases	19·43 per cent.	80·57 per cent.
Fatal	30·43 "	69·57 "

The significance of "watering" is here very marked; over 80 per cent. of the colic cases are attacked after the horse has been "watered."

It is now important to see how far this is maintained throughout the twenty-four hours. For this purpose we have divided the day into eight groups of three hours :—

	Colic cases Before water	Colic cases After water	Fatal cases Before water	Fatal cases After water
1 a.m. to 4 a.m.	0	6	0	2
4 ,, ,, 7 ,,	26	19	14	10
7 ,, ,, 10 ,,	12	83	7	5
10 ,, ,, 1 p.m.	36	113	6	11
1 p.m. ,, 4 ,,	10	119	0	5
4 ,, ,, 7 ,,	60	191	0	23
7 ,, ,, 10 ,,	3	82	0	4
10 ,, ,, 1 a.m.	0	17	0	5

The table shows that from 4 a.m. to 7 a.m. both colic and fatal cases were more liable to attack before than after water, but that may be due to the fact that the large majority of horses would be watered after 7 a.m.

From 7 a.m. to 10 a.m. the influence of water is very marked, seven times as many cases of colic occurring "after" as compared with "before" watering. The fatal cases at this period still show an excess among those that have not watered over those that have.

From 10 a.m. to 1 p.m. there are three times as many cases of colic "after" as "before" water, and for the first time there are more fatal cases among the watered as compared with the unwatered horses. From 1 p.m. to 4 p.m. there are eleven times more colic cases among the "watered" horses; from 4 p.m. to 7 p.m. four times as many; from 7 p.m. to 10 p.m. twenty-seven times as many; and from 10 p.m. to 1 a.m. seventeen times as many. Strange to say, among the fatal cases not a single horse was attacked "before" watering after 1 p.m. in the day.

The irresistible conclusion from these observations is that "watering" exercises an enormous influence over the production of colic and fatal disorders of the stomach and intestines. The question is, How does it act? To this the only reply is that its action must be mechanical, sweeping out the imperfectly digested contents of the stomach, which consequently set up irritation. Under natural conditions a horse is practically always eating, and the small size of the reservoir known as the stomach explains the necessity for this. He will eat nearly throughout the whole day and night, broken only by extremely short periods of sleep, and he drinks when he feels thirsty. Under the conditions of domestication he has to eat, but more particularly drink, at those times when it is convenient to give it. He cannot always be feeding, as he is required for work, and the food he should take twenty-four hours to consume is compressed into the working day

of twelve hours. The arrangements necessitated by having to place horses in stables are not suited to the peculiarities of the animal's digestive apparatus, which demands little and often. When we see the nosebag being put on the horse in the streets the moment he comes to rest, we have no difficulty in recognizing that the principle of "little and often" is being intelligently carried out.

But water is not the whole explanation of colic and fatal disorders of the digestive system, for 20 per cent. of colic cases and 30 per cent. of fatal cases occur before watering. Work as a cause of colic and fatal digestive disorders is quite undoubted; whether its effects are produced in consequence of work suspending digestion, or whether it be due to the actual strain of work acting mechanically on the digestive canal, cannot be stated, but the fact is undoubted; 76·8 per cent. of the horses attacked with colic were known to have worked on the day of attack, and 23 per cent. were idle. Strange to say, practically the same proportion was observed among the fatal cases; 76 per cent. had been or were at work, and 24 per cent. idle.

If the working day of the army horse be taken as extending from 7 a.m. to 1 p.m. we should expect, if work were a factor in the production of the disease, to find more cases of colic occurring in the working than in the non-working day; but as a matter of fact it is not so. Between 7 a.m. and 1 p.m. 273 mixed cases of digestive disorder occurred, while from 1 p.m. to 7 p.m. 398 seizures took place. Yet it may well be that disturbance set up by work in the morning might not develop until the afternoon, especially if these processes were of a chemical nature. Further, the major part of the colic and fatal cases occur in the late summer, the period of manœuvres, when afternoon work would be taking place.

The seasonal prevalence of colic might also be explained by the amount of water consumed, but we believe it supports the view that work is a factor, the only difference between the summer and winter life of the army horse being that he does more work in the former. Our impression is that draught horses are more liable to colic and fatal disorders than riding horses, and the figures available this year support that view. If extended enquiry should prove this to be the case, it still further strengthens the case against severe muscular work as a cause.

There is equally good reason for believing work to be an important cause of fatal cases of the digestive system.[1] Yet again, when sub-

[1] These fatal cases are remarkable for the peculiarity of the lesion. The stomach of the horse bursts as if struck by a shell, or the intestines rupture just as if they had been deliberately torn by hand. More remarkable still, the bowels tie themselves in a knot of such complexity that even at *post-mortem* examination they frequently cannot be untied. In no other animal than the horse have such lesions been described.

mitted to the test of the figures available, very little support is given. During what we have spoken of as the working day, 7 a.m. to 1 p.m., twenty-nine fatal cases occurred, while twenty-eight were attacked during the non-working day. On the other hand, as just pointed out, the majority of fatal cases occur in the late summer, at a time when afternoon work is being performed.

Very few fatal cases are attacked between 7 p.m. and 4 a.m. This is naturally a period of repose. On the other hand, there is quite a violent outburst between 4 a.m. and 7 a.m., the chief intensity of which is between 6 a.m. and 7 a.m. This cannot be due to work, though it might be due to water. The figures of the 4 a.m. to 7 a.m. outburst are very remarkable; out of a mixed total of sixty-nine cases which occurred during that hour no less than twenty-four proved fatal, while out of 264 mixed cases seized between 4 p.m. and 7 p.m. only twenty-three proved fatal. Any explanation of the remarkable outbreak between 6 a.m. and 7 a.m. cannot for the present be attempted.

On an average there are four times as many fatal intestinal as stomach cases, but the proportion between intestinal and stomach trouble grows less and less as the day advances. For instance, in the morning the proportion is 8 intestine to 1 stomach; at midday 3·5 intestine to 1 stomach; and in the evening 2·4 intestine to 1 stomach.

The tables which are appended to the report show that the fatal cases included: stomach affections 15 (rupture 14, impaction 1), enteritis 13, volvulus 18, ventral hernia 2, intussusception 4, impaction of intestine 3, strangulation 10, rupture of intestine 14, calculus 3, diarrhœa 1, peritonitis 7, rupture of liver 1, entozoa 1.

In attempting to deal with the question of prevention, we must consider the three main features in the life of the horse, viz., water, food, and work.

By watering horses more frequently, say four instead of three times a day, less will be consumed at a time, and if our reasoning is sound this should be productive of benefit. But unless we adopt the system of always keeping water before the horse, it appears impossible to avoid washing a portion of one or more meals out of the stomach.[1] It is certainly avoided at morning water, a period when, unfortunately, although the channel is clear, many horses drink very little. It is just possible at midday water to avoid washing out portions of the morning feed, but it seems impossible to avoid it in the evening. If it is not

[1] Since this was written the Commandant, Mounted Infantry, informed me he always keeps water by his cobs. How far does this explain their comparative immunity to colic?

avoided, then it appears possible that horses become tolerant of the process of imperfectly digested material being washed into the intestines, otherwise it is difficult to explain why 96 per cent. of the animals escape a whole year without an attack of abdominal pain.

And so with feeding ; a twenty-four hours' supply has to be given in twelve hours, and safely conducted through a small bag incapable when crammed of holding more than one-fifth of the total daily ration. That it does not fail more often is somewhat surprising, but the adaptability of the body is one of its strong features. The principle of "little and often" embraces the golden rule in feeding horses. The colic of work may yet be shown to be due to the intervals between feeding being too great, or the large amount of water consumed. During a long march, or a long day's operations, "little and often" should be practised ; horses should be watered as frequently as possible and fed, if for only five or ten minutes at a time. This will enable an animal to get through much of the day's ration without an undue accumulation for the evening, and no ill consequences need be expected when work follows a light feed. The cab horse in this matter forms an excellent guide ; he should be followed in preference to the racer or hunter.

More colic cases occur on a Wednesday and fewer on a Sunday. Wednesday is a half-holiday, and the excess of colic on this day might mean want of care or want of supervision, but Saturday is also a half-holiday and no excess is shown on this day. On Sunday we should naturally expect fewer cases if the previous reasoning we have brought forward is sound, but the number of observations are at present insufficient to admit of any definite conclusions being drawn.

There are certain horses liable to colic, *i.e.*, greedy feeders, "windsuckers," or animals the bowels of which contain foreign bodies, sand, calculi, &c. ; but after every possible cause has been exhausted there are still 70 per cent. of fatal cases of the digestive system for which no primary cause can be assigned, nor discovered on *post-mortem* examination.

STERILITY OF THE COW AND ITS RELATION TO INFECTIOUS DISEASES OF THE GENITAL ORGANS.[1]

BY DR. E. HESS.

Professor at the University of Bern.

DISEASES of the genital organs belong to the most frequent and important ailments of the cow, their number in this ambulatory clinic during the last twelve years averaging 1,200 to 1,400 per annum, or 35 to 40 per cent. of all ailing cattle brought in for examination. These striking facts account sufficiently for the frequent complaints of our cattle-owners concerning the sterility prevailing among their herds, as well as for the money expended, and puffing indulged in concerning "unfailing pregnancy producers."

As a ground-work of what ensues we have been observing and explaining the sterility of the cow for twenty-five years in the ambulatory clinic, and have made observations in many thousands of cases; further, we published the work, "Report by the Swiss Veterinary Surgeons Society on the Examinations Conducted in the Nodular Disease" (*die Knötchen seuche*), Bern, 1905, and "The Sterility of the Cow" (*Schweizer-Archiv für Tierheilkunde*, p. 351, 1906), as well as recorded statistics, forty in number, on 300 cows, with the special object of ascertaining the causes of sterility of the cow. The reasons why the statistics, in spite of the trouble and time expended and the plentiful supply of clinical material did not comprise more cases are as follows: Firstly, all those numerous histories of illness with uncertain or faulty anamnesis were eliminated, and secondly, in every case of illness notes on the question at issue were not possible. The 300 clinical cases observed by us were those in which the form of the illness was verified and noted at the time, and in which a diagnosis of the true nature of the cause of the sterility of the cow as evinced in our neighbourhood was justified.

It is generally accepted by practising veterinary surgeons in the country here that the prevalent use of artificial manure and feeding stuffs, especially the great employment of rye, barley, maize, barley meal, grains, and malt, as well as deviation from natural maintenance, constant housing, and so on, favour the production of this complaint. In the year 1829 Meyer touched on this question, and Solothurn wrote on "Non-pregnancy of the Cow."

According to our statistics sterility is generally most frequent in

[1] Presented at the Ninth International Veterinary Congress at The Hague, September, 1909.

pure-bred, early matured milk and breeding stock, constantly housed, especially in neighbourhoods and farms with intensive milk and feeding management. In naturally fat and tended animals with a robust constitution and greater vital energy acquired by exercise and grazing in the fields, sterility is much rarer than where great milk secretion is aimed at and the activity of the fœtus-bearing organs weakened, consequently diseases of the genital organs and sterility occur more readily in stall-confined animals. Besides, it is not wise to depreciate the numerous specific and non-specific infections of the genital organs which are favoured by stalling, trade, and traffic.

From what precedes, it follows that sterility of the cow has been etiologically divided in veterinary literature into: (1) Specific and plainly *non-infectious* disease of the genital organs; (2) a specific *infectious* form arising *through infection* of the genital organs.

I.—Non-infectious Diseases.

According to Zchokke's schematic collection of the causes of the unfruitfulness of the cow (*Landw. Jahrbuch der Schweiz*) and our own observations, non-infectious sterility of the breeding animal occurs under the following conditions:—

(1) *In the Male.*—(*a*) *In bodily unfitness* arising from too young and too old age, debility, fattening, painful conditions in the joints (arthritis, sore hock-joints), in the claws (foul, foot soreness), or muscles, so-called loin weakness, and relative smallness of the bull.

(*b*) *In lack of desire to mount,* generally due to illness (fever, indigestion, chronic tympanitis, diarrhœa, brain trouble), complaints (painful conditions), and malformation of the genital organs, great bodily fatigue, over-use (over-leading), enervating or insufficient nourishment (grains, maize), too high feeding and lack of exercise, incomplete acclimatization, individual aversion, and the at times over-joy accompanying a jump too long held back, leading to casting away of the seed (onanism).

(*c*) *In Unfitness at the Covering Act* (*Mating Impotence*).—Diseased conditions of the genital organs, warts, inflammations, thickenings, wounds and cracks of the penis, as well as closure, tumefaction and other affections of the vagina.

(*d*) *In Inability to Fructify* (*Procreation Impotence*).—Genital malformations (hermaphroditism), incompleteness, calcination, swellings of the genital glands, aspermia, aroospermia, non-acclimatization, exhaustion, old age, too early and too lustful employment in breeding, in-and-in breeding, insufficient nourishment and care, bodily pro-

tuberance, fatness in youth. Impotence in a male animal is as a rule declared when a normal cow has been covered with no result (unrest of the animal, disproportion of the parts, sunken vagina, &c.). In this case the practical man has a healthy cow covered again, or tries to breed with a different animal before he declares either the male or female unfruitful.

(2) *Causes in the Female.*—(*a*) When the œstrum (bulling, coming in season) is deferred or quite absent.

(i.) *General Causes.*—Immaturity, great age, atrophy of the ovaries due to old age, fatness, phlegmatic temperament, continuous housing, at the beginning of food and dwelling changes, general nourishment disturbance (too small or large absorption into the system), bad care, stringy, enervating nourishment, cold, wet, tasteless food (poor grass), digestive disturbances of all kinds that lead to lack of appetite or laxity, great milk production (after the act of parturition), muscular exertion, general illnesses, infections (tuberculosis), fever, cold, organic disease of the brain, liver, kidneys, as well as painful conditions, cachexia (pyemia, cancer), all too long non-satisfaction of desire, certain medicines (narcotics).

(ii.) *Special Changes in Regard to the Genital Organs.*—Congenital malformation (hermaphroditism) or genital functional weakness (in consequence of the incestuous intercourse), degeneration of the ovaries through cysts, tumours (cancer, tuberculosis), chronic inflammatory processes (sclerosis, cicatrization), non-development of the yellow bodies (in consequence of abnormal feeding), diseased condition of the womb: retained dead fœtus, mucous or purulent fluid, catarrh of the mucous membrane of the womb (leucorrhœa).

(*b*) *If the Œstrum is too Weak.*—The intensity and continuance of the appearances of normal œstrum are individually different. Close observation is essential as well as instruction of the attendant. The appearances of œstrum are scanty; in weakened individuals (in consequence of great milk production, work, food badly absorbed, illness, continuous stalling, insufficient and fibrous food), not suitable acclimatization.

(*c*) *If Rutting Occurs, but Conception is Wanting.*—(i.) If œstrum occurs regularly every three weeks but conception is absent, mechanical hindrances at copulation, small breeding animals, sunk-in vulva and vagina. Unrest in consequence of anxiety (heifers), tumours, cicatricial strictures in the vagina. Further in too copious œstrum; full-blooded animals, too strong nourishment, too early leading, great sensitiveness in the vagina, injuries through which straining and

pressing occur, os uteri remaining open, lodgment of mucus in the vagina (acid reaction?), closure of the mouth of the womb, too late mating, enlargement of the lips of the os uteri; vaginal catarrh, erosions, painful conditions of the womb (sclerosis, calcification of the cotyledons, closure of the Fallopian tubes).

(ii.) Œstrum occurs too frequently or continuously. Whether injuries of the brain or clitoris, or chiefly those of the birth-tract, lead to this is uncertain. In rare cases too frequent coming in season may be noticed in normal animals. As a rule one considers it due to diseases of the ovaries—cystic degeneration, dropsy of the ovary, acute tuberculous inflammation of the ovary.

(*d*) *If the Animal Conceives, but the Fœtus does not come to Maturity* (*Abortion*).—(i.) In consequence of abnormal position or development of the young—malformations, pressure on the navel string, &c.

(ii.) Death of the fœtus in consequence of an infection of the vagina—contagious abortion.

(iii.) General feverish illness of the mother—infectious illnesses.

(iv.) External influences acting directly or indirectly on the womb —blows, thrusts in the groin (narrow stalls), ill-treatment (blows on the nose), violent falls, incautious rousing, abnormal way of getting up, great fatigue, fright, cold (especially through cold food and drink).

(v.) Poison, purgatives, spoilt food.

Whilst many of these nominal causes have been investigated and are only established as such on account of general symptoms or certain conclusive observations, others, such as the exhaustion of breeding animals, dominant influence in pregnant animals, are withheld for further consideration.

It is not a matter of doubt that lack of desire and impotence, as well as some ovarian and uterine diseases, as cystic degeneration of the ovaries, mortification and maceration of the fœtus, abortion, *endometritis catarrhalis aut purulenta chronica und lyometra*, occur equally in non-infected and infected genital organs, and declare themselves by quite similar symptoms, on which account their certain etiological significance is at times surrounded with great difficulty; but with the improvement of present-day clinical methods of examination (bacteriological examination and inoculation of preputial and spermatic secretion, vaginal speculum and spectroscope, bacterial examination and inoculation of the vaginal, cervical, and uterine secretions, which are suitable for *vaginitis follicularis infectiosa*, benign vesicular disease, and tuberculosis and retraction of the mouth of the

womb), the number of these etiologically doubtful cases will always become smaller.

II.—Infectious Forms of Sterility.

Under infectious illnesses of the genital organs may be named benign vesicular disease and tuberculosis of the genital organs, especially of the uterus, which is rare. They need no special mention here. Of the latter complaint we have had a yearly average in our clinic of one to two cases of ovarian and four cases of uterine tuberculosis which were diagnosed.

Under infectious illnesses of the genital organs the greatest etiological importance attaches to contagious vaginal and uterine inflammation, and it is a disease by far the most frequently brought to our notice. Synonymous terms are "bösartige chronische Bläschenseuche" (Hess), "Knötchenseuche" (Iseppoin), "Knötchenauschlag," "austeckender Scheidenkatarrh" (R. Fröhner and Martens), "Vaginitis et Metritis follicularis infectiosa" (Hess), Vaginitis infectiosa granulosa, Vaginitis verrucosa (Trommsdorft), Vaginitis granularis infectiosa bovis (Raebiger), Colpitis granularis infectiosa (Ellinger), Vaginitis follicularis, "Colpitis follicularis," Collitis follicularis infectiosa (E. Fröhner), "Vaginite granuleuse de la Vache," "Vaginite infectieuse ou contagieuse."

In seventy years of the preceding century this disease has been observed in certain parts of Switzerland. Highly interesting investigations have been made by Ostertag, who found in the vaginal secretion a diplococcus and short streptcococcus. The above-mentioned report by the Swiss Veterinary Surgeons' Society on the nodular disease was of great interest from a national, economic and breeding point of view, as the complaint occurs frequently enough in our practices, though it is rarer, thanks to the intelligent foresight of the cattle-owner, and especially the breeder, than it was during the years 1903 to 1906.

According to the statistics of the Swiss veterinary surgeons got together in 1903 and 1904, the number of male animals attacked was much smaller than that of the females. Altogether 344 cowhouses with 4,322 (4,207 female and 115 male) animals were examined. Of these 1,727, or 40 per cent., were declared healthy, and 2,595, or 60 per cent., were found to be infected. Of the females 1,667, or 40 per cent. were healthy, and 2,540, or 60 per cent., infected.

The infected female animals included 340 far advanced in pregnancy, 506 pregnant under 16 weeks, 116 non-pregnant, 395 never

covered, 131 affected with abortion. The non-infected consisted of 934 in calf and 733 not so. Of the bulls, 60, or 52 per cent., were healthy, and 55, or 48 per cent., infected. In the 344 byres examined, 1,780 head were in calf and 2,427 non-pregnant.

Of the pregnant animals, 846, or 48 per cent., were infected; 934, or 52 per cent., healthy. Consequently infection had spread to nearly half of the in-calf cows examined.

Vaginitis follicularis infectiosa may occur both as an enzootic and epizootic, and in many cases is strikingly frequent on account of infection of the bulls in 75 per cent. of cases chronically and in 25 per cent. acutely. Whatever its relation to the procreativeness of breeding animals, our numerous observations establish the fact that the male organs may be severely affected without one being in a position to observe any external changes. Complaints of the unfruitfulness of breeding animals and of the infection of cows by the above-mentioned animals are general in certain districts, especially during the early spring and summer, and there are infected steadings in which in single years the pregnancy figure is only 5, or 20 per cent.; indeed, in the course of the last nine years we have noticed a fact very fatal to good husbandry, *i.e.*, that in farms of five to sixteen head not one animal has been pregnant in the late summer. Very often infected animals or those that have been infected show diminished desire to cover, and after two or three infections inability to cover and powerlessness to fructify (impotence).

With regard to procreativeness, we have noticed that this can fail in spite of very energetic covering, and that chronically affected as well as clinically treated and healed animals jump one another very violently and quickly without producing young. This we attribute to long-continuing hyperæsthesia of the genital organs. In consequence of the abnormal and rough coitus the female animal is so torn that for several hours after copulation she presses and strains violently. This fact is erroneously considered by the owner to be quite normal in breeding animals.

We have further noticed several times that young and old animals. if only having suffered from one severe attack, and after healing of the complaint will exhibit lack of desire to jump, or the covering act will be performed more slowly, or the female well covered does not sink down at the time. In consequence of the long drawn-out coition small and medium sized -cows, especially if weak in the back, will collapse—a case of being "over-ridden." Conception not occurring, a repeated jumping is necessary. In young bulls lack of desire to jump and

6

impotence are only transitory, this lasting until swelling of the penis, in consequence of acute infection, declines. Experience teaches that with careful therapy and four to six weeks' cessation of serving the covering act can again be performed with its usual briskness.

Another observation made for years has established the fact that freshly infected young animals and those that have been longer infected, whose procreativeness has been considered healthy, but which have been infected by a diseased bull, almost regularly abort in the first three to twelve weeks of pregnancy—contagious abortion. Another fact is interesting, in that lined cows infected by old diseased bulls, now apparently healthy, exhibit a purulent vaginal discharge six, nine, twelve to twenty-one weeks after the covering act, this being accompanied by death of the fœtus, maceration of the same, and *endometritis purulenta chronica*. Whether this is due to early exhaustion of propagation capacity (senescence), or to the infected seed being driven back by the remains of the nodular disease, has not yet been decided. Uncertain also are the etiological connection between nodular disease and the visible emaciation noticeable in affected animals, the thickening of the vaginal mucous membrane, strictures, and hæmorrhages from the vagina, vaginal abscesses, cystitis and nephritis, as well as necrosis of a testicle noticed several times by us, and in which among other organisms the *Bacillus necrophorus* can always be found.

The material or pecuniary loss caused by nodular disease of breeding animals will be very significant for corporations and companies, and considerably greater than for the private owner. The following are the chief disadvantages: temporary exclusion of breeding, partly in consequence of illness and partly from fear of conveying it, great and prejudicial injury to procreativeness, too frequent changes of the bulls, early surrender of many very valuable breeding animals to the butcher, compensation for this by using bulls of little value, depreciating the character of the stock, and disorganization of the cattle-breeding operations.

Concerning the connection between *vaginitis et metritis follicularis infectiosa* and sterility of the cow the following statistics are available:—

Of the 300 cows belonging to seventy-five different owners examined for barrenness 173, or 58 per cent., suffered from more or less well-marked infectious catarrh of the vagina, and 127, or 42 per cent., showed no symptoms of it. Only in eleven of the 173 were acute symptoms shown, such as soiling of the ventral surface of the tail, damp hair at the vulva, swelling of the vulval lips in company

with vaginitis, purulent discharge from the vagina, highly injected or red follicular swellings from a millet-seed to a pin-point in size, plainly prominent and easily felt on the vaginal mucous membrane.

The remaining 162 head suffered from *vaginitis follicularis infectiosa chronica*, which was characterized by small or absent swelling of the vulva, lack of discharge, fading away of the nodes, disappearance of the inflamed area round the nodes, absence of inflammatory symptoms on the mucosa vaginæ, as well as the occurrence of a light yellow colour, which latter is, however, often present in cows far advanced in pregnancy with quite intact vaginal mucous membrane.

From our observations, we believe that there is an intimate connection between the inflammatory appearances of the vaginal mucous membrane, and the activity of the infective virus, and we certainly consider that the latter disappears with the onset of chronicity of *vaginitis follicularis infectiosa.*

Closer examination of the statistics shows that sterility occurred in 173 head in 77 per cent. of cases in three- to six-year-old cows, whilst the three-year-old cows shared 23 per cent. of the sterility cases, and that at the age of 7 to 12 years cases of unfruitfulness were of rare occurrence. Of the 127 remaining cows not suffering from the so-called "not infectious sterility," 69 per cent. were of the age of 3 to 6 years, and the three-year-olds participated in 4 per cent. of these cases. This (*i.e.*, in the three- to six-year-olds) percentage may be explained by assuming that the older animals, being often affected, acquired some degree of immunity, but younger animals with tender, sensitive vaginal mucous membranes possessed no immunity. It is known that ten to twelve-year-old cows, with great, slack, wide vaginæ, as well as younger ones with sinking of the broad pelvic ligaments, nymphomania and prolapsus vaginæ, are very seldom or never found to be infected. Our figures teach us, further, that the cases of sterility in 72 per cent. of the infected cattle and 63 per cent. of the non-infected, were brought for examination in the months of May, June, July, and August, and that the gradual rise in the number of patients only bears little relation to the jumping period (*i.e.*, at certain times of the year). It is certain that the time of the year is only of minor significance, yet, according to the earlier or later, the more intensive or less intensive accomplishment of the covering period in a neighbourhood the number of unfruitful animals diminishes.

The deleterious influence of *vaginitis et metritis follicularis infectiosa* on the specific genital organs has been called attention to in the

report of the Society of Swiss Veterinary Surgeons. Experimental examinations and sections showed that inoculation of the vaginal secretion of cattle affected with acute nodular disease, with *vaginitis follicularis infectiosa*, affected *mucosa vestibuli*, and *mucosa portionis vaginalis uteri*, on to the vaginal mucous membrane of healthy cattle caused a catarrhal purulent colpitis, further that a like colpitis is brought about by inoculation from a pyometra, which has arisen, as we have proved, in consequence of an infected vagina. Catarrh of the uterus, death, and maceration of the fœtus arose. We established, further, both clinically and *post mortem*, that a contagious vaginal catarrh could be set up by inoculation of discharge from a recent badly affected vagina of a cow into the normal vaginal mucous membrane of a young six weeks *post-partum* milk cow, and that by continuity endometritis might easily arise.

In another case, in a two-year-old cow, whose vaginal mucous membrane had been rubbed with fresh matter from a cow badly affected with *vaginitis follicularis post partum* eleven days after inoculation showed contagious vaginal catarrh, and by continuity hyperæmia of the uterine mucosa.

The incubation stage depends on the virulence of the material inoculated. As far as the inoculation of virulent material in our cases proved, it varied from twenty to seventy-two hours.

It is of significance to the breeder, and of interest to the veterinary surgeon, that inoculation of material from the scrotum, prepuce and glans penis of a subject infected in the urethra with chronic nodular disease, but showing no clinical symptoms, did not cause any disease of the vagina inoculated, but material from the mucosa of the pelvic portion of the urethra, from the sigmoid flexure to the neck of the bladder, gave a *positive* inoculation result. These facts, not to be under-valued, agree with observations made in human medicine, whereby it is found that gonococci are most frequently situated, and cause greatest harm in the deeper portions of the urethra, away behind the *pars prostatica*. Sequelæ of nodular disease, according to the Society of Swiss Veterinary Surgeons, are: anaphrodisia, too frequent œstrum, failure of conception in spite of the normal every three weeks' œstrum, abortion in all stages of pregnancy; maceration of the fœtus, pyometra, *retentio placentarum, endometritis catarrhalis et purulenta* (*fluor albus*), ovarian cysts, hypertrophy of the corpus luteum, cartilaginous enlargement of the cervix uteri, with pronounced œstrum and stricture of the cervix uteri during œstrum.

What are the direct consequences of *vaginitis follicularis infectiosa* according to our statistics?

Of the 173 animals brought for examination with acute or chronic nodular disease, ninety-one head showed a disease of the ovaries, representing 57 per cent., and of these forty-one head, or 42 per cent., suffered from cystic and a small number from fibro-cystic degeneration of an ovary, seldom of both ovaries. Of these forty-one head, thirty-six, or 88 per cent., showed nymphomania. Four of these suffered besides from endometritis catarrhalis acuta, and six from endometritis catarrhalis chronica. Five head, in spite of degeneration of the ovaries, showed no erethric nymphomania, but so-called "Stillochsigkeit." The sinking of the broad pelvic ligaments in union with ovarian cysts caused no abnormal genital disturbance (desire for the bull), beyond either only temporary, very insignificant signs or none at all of the appearances of œstrum, on which account such cattle fattened well.

Of the ninety-one cattle with ovarian illness, fifty, or 58 per cent., had one, generally the right, and only exceptionally both ovaries, affected with a hypertrophied *corpus luteum spuriun* from the size of a walnut to a hen's egg. This hypertrophied yellow body is to be distinguished from *corpus luteum verum s. gravidisatis, corpus luteum spuriun s. menstruationis, corpus luteum persistens* and *corpus albicans.* Corpus luteum spurium hypertrophicum occurs in cows and cattle affected for some weeks or months with nodular disease, and causes a diminution in œstrum for many months, this being shown by a normal and abnormal heat, the first in non-pregnant cattle being divided into the true and false after rutting, whilst in pregnant cattle an open visible and calm heat occurs. After cure of infectious *vaginitis follicularis* œstrum occurs generally every three weeks, more rarely every nineteen to twenty days, but conception does not ocur, however, in spite of changes with healthy sires. Œstrum is either short, twelve to fifteen hours, or its continuance is normal, lasting fifteen to twenty-four hours, or it may be long, lasting twenty-four to forty-eight hours. It is always, however, too pronounced. Accompanying the abnormal genital disturbance there is often a transitory but plain diminution of appetite and milk secretion, and slight sinking of the broad ligaments of the pelvis. Further, after being served, the animals often exhibit violent straining, and after expiration of the very plain symptoms of heat, a bloody-red slimy discharge, a very unfavourable prognostic of conception ; rectal palpation between the two rutting periods shows an ovary much enlarged, in fourteen- to twenty-day-old cases a hard, elastic, ball-shaped, warty structure, as thick as one's thumb and longer, plainly bounding a false yellow body.

In the remaining eighty-two head affected with *vaginitis follicularis* the following causes of sterility were ascertained: *endometritis purulenta chronica* in consequence of abortion in twenty-four head, or 29 per cent., pyometra in consequence of death and maceration of the fœtus in twenty-one head, or 26 per cent.; *endometritis catarrhalis aut purulenta acuta oder chronica* in sixteen head, or 19 per cent.; acute contagious catarrh of the vagina in eleven head, or 13 per cent.; anaphrodisia in conjunction with chronic nodular disease in six cows, and besides various severe strictures at the introitus vaginæ in ten head, or 12 per cent.

Of the 127 cows affected with sterility *but not* with *an infectious genital disease*, there was disease of the ovaries in ninety-three head, or 73 per cent., and of these seventy-nine, head or 62 per cent., had cystic or cysto-fibrous degeneration. Of these ninety-three animals thirty-seven, or 29 per cent., suffered from nymphomania; with nymphomania and secondary prolapsus vaginæ ten head or 8 per cent.; from nymphomania with secondary endometritis catarrhalis aut purulenta chronica, twenty, or 15 per cent.; from stillochsigkeit, twelve, or 10 per cent.; .from anaphrodisia in consequence of persistence of the yellow bodies, fourteen, or 11 per cent. In the thirty-four, or 37 per cent., still remaining sterile, not infected cattle, whose ovaries were normal, the following abnormalities existed: In six head *prolapsus vaginæ* as the result of relaxation, and *endometritis purulenta chronica* in consequence of abortion; in three head, pyometra; in one cow rudimentary uterus and stunted ovaries; in twelve head, decline of œstrum; in the rest, normal genital organs; in six head, anaphrodisia from an unknown cause.

It may be gathered from a comparison of these facts that the number of sterile animals affected with nodular disease is considerably greater that that of non-infected animals, and very often that nodular disease leads to a *corpus luteum spurium s. menstruationis hypertrophicum.* On what irritation this significant growth of the *tunica interna folliculi*, consisting chiefly of increased formation of lutein cells from the cells of the tunica interna folliculi depends, is not yet made plain.

It is, further, a striking fact that since the increased occurrence of contagious vaginal catarrh, not only ovarian illnesses, but also abortion, pyometra, and endometritis cases have experienced a great increase, and that cattle affected with *vaginitis follicularis* uncommonly frequently suffer from chronic diseases of the ovaries and uterus at the same time.

According to our observations, extending over many years, we

found on an average in about 74 per cent. of cases, and more especially in 26 per cent., when the animals were treated with slightly corrosive and irritative injections into the vagina that œstrum was delayed for weeks and even months.

Of the 173 animals affected with sterility and nodular disease, forty-one head, or 24 per cent., were *regularly* in œstrum every twenty-one days; one rutted every twenty-four days; of the remaining 131, seventy-nine head were *irregularly in season;* of these, eight cattle were affected with *corpus luteum spurium hypertrophicum*, thirty-six with nymphomania, twenty-four with endometritis, and eleven with acute *vaginitis follicularis infectiosa.*

Of the first-mentioned head of cattle, œstrum occurred every eighteen to twenty days; in the remaining seventy-one head at intervals of ten days to four months, and in one case only after nine months.

Thirty-six head did not come in season at all during our period of observation; of these five had "stillochsigkeit," twenty-one had pyometra, and ten were affected with chronic nodular disease, and only one came in bulling and was jumped; sixteen head, in which *endometritis purulenta* was established, were noticed by the owner to have a muco-purulent discharge from the vagina.

Interesting was the anatomical fact that in seven of the subjects affected with pyometra, the uterine collection of pus arose in connection with the covering act.

The death of the fœtus in nine to twelve weeks of pregnancy with secondary maceration and formation of a collection of matter in the uterine sac occurs relatively frequently, and is bound up with many disadvantages, which all have one thing in common, that is, that they prevent fruitfulness. We have found twenty head of one breed of cattle affected with pyometra. A result noticed by us in twenty cases was that of deceptive pregnancy from pyometra. When œstrum ceases in one or several jumped cows, the owner believes conception has occurred, but when the animal should be several months advanced in pregnancy is surprised to find that in place of a fœtus, a more or less plentiful supply of pus is present in the uterus. In many cases also a slight opening of the mouth of the womb is connected with a sparse purulent discharge; in other cases the mouth of the womb only opens when the collection of pus has reached many litres in quantity, and the uterine walls become greatly stretched; again in others only during the rutting period in isolated cases quite regularly, and in others irregularly.

In regard to conception, ninety-one out of one-hundred-and-two of the Swiss veterinary surgeons declared that nodular disease was a factor unfavouably influencing fruitfulness, and that indeed this occurred, especially in acute severe cases, whilst in slighter acute, in chronic as well as in cured cases, fruitfulness was influenced little or not at all.

Many veterinary surgeons noticed that if the cattle were acutely infected *ante coitus* no conception occurred, whilst if infection was caused with the covering act fruition took place quite well. Some other collegians, however, state that there are acutely and severely infected steadings where the ability to conceive, pregnancy, or conditions of birth are in no way influenced. On the other hand, it must be acknowledged that in infected standings on many occasions fruitfulness does not occur at all until the complaint has completely disappeared.

It has been known for a long time that acutely infected cattle come on heat three, six, nine or twelve weeks after infection, and indeed, especially if the nodular disease affects the *portlo vaginalis uteri.* Many a time the cattle-owner seeks veterinary help if there is a diminution of œstrum, and the professional man called in finds on examination that certain cows have been led to the bull three, six, or ten times; he can then discern in most or all of the head all the different stages of nodular disease together with secondary disease of the genital apparatus.

As already related of the 173 cows affected with *vaginitis follicularis infectiosoa* 137 came in œstrum, and thirty-eight did not. Of these 137 head thirteen animals examined had not yet been jumped. There were served: Once, 40 head; twice, 39; thrice, 20; four times, 8; five times, 6; six times, 4; seven times, 4; eight times, 1; ten times, 2. This works out at an average of 2·5 jumps a head, a circumstance which leads to overworking of breeding animals and early impotence.

It was important to know how many of the 173 head examined which were sterile became pregnant again. Through sale, castration, fattening, and slaughter this gap could not be filled up. It is certain that many owners report six months after conclusion of treatment only 40 per cent. pregnant. This significant fact agrees with our observations that after nodular disease power to conceive is greatly reduced, and is most pronounced in those cases where the animals are irrationally treated or not at all, whilst in many places where the illness is fresh without chronic complications, and rightly and rationally treated, the ability to conceive, almost without exception, returns in a few weeks.

Now and again it happens what is worth while for the practitioner to know, *i.e.*, between healing of nodular disease and the occurrence of conception some weeks, and indeed months, may elapse.

Whether retentio placentarum so frequently occurring has any etiological relation to vaginal catarrh is not certain from our statistics. It is certain that this follows in nodular disease, as well as after abortion, and also after normal course of pregnancy, and we could up to now see no difference between the coming or not coming away of the cleansing after infectious abortion, and after accidental abortion through mechanical causes.

CONCLUSIONS.

(1) Sterility of cows stands in intimate relation to infectious illnesses of the genital órgans, especially to vaginitis and metritis follicularis infectiosa.

(2) Since the prevalence of infectious catarrh of the vagina and uterus the number of ovarian and uterine affections has quite significantly increased.

(3) The hypertrophy of the corpus luteum spurium peculiar to the cow, and seen in vaginitis et metritis follicularis, is brought about by their stimulant effect on the ovaries.

(4) Statistics taken on infectious catarrh of the vagina, its causes and effects, are to be recommended in the different states.

(5) In connection with the rational examination and treatment of diseases of the female animal genital organs, seeing its great prevalence, and with a view to enhance the value of the veterinary profession, to advance science, and to improve national efficacy, it is desirable that a palpation course of the female genitalia be introduced into the student's curriculum, and made absolutely necessary

(6) Animal experimental stations are also pressingly necessary, in which clinically and experimentally the influence of infectious genital diseases on fruitfulness may be thrashed out.—G. M.

JOINT EVIL IN FOALS.

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JOINT EVIL is known under different names in the United Kingdom, *e.g.*, navel ill, navel evil, joint ill, omphalitis, omphalo-phlebitis, septic omphalitis, pyæmic arthritis, septic arthritis, &c. The above are good names for the disease, while at the same time they tell us there is something wrong with the joints, and in some instances with the navel. Joint evil, after all, I think the best term.

Definition.—A disease of the sucking foal, due to infection of the

system by certain organisms, causing extensive changes in joints, and sometimes in various organs.

Etiology.—From the researches of Schoule and Ostertag, it is due to infection of navel wound, and then a general infection of the body, and the pyogenic organisms, viz., *Staphylococcus pyogenes aureus* and the *Streptococcus pyogenes*, are responsible.

The above two organisms have been isolated from the lesions of joint evil. "Uffriduzzi cultivated two separate bacteria, a micrococcus and a bacillus, from the bodies of calves which had died of this disease, and successfully inoculated animals therewith, while he observed not only pyæmic, but also septicæmic symptoms, so that it may be presumed that from the infected navel wound both pyæmia and septicæmia may develop. Buch found in the liver micrococci which had a likeness to the diplococci of pleuro-pneumonia. Turner found the same bacteria in the membranes of the ovum of brood mares suffering from epizootic abortion as in the organs of foals that died of 'limping.' Cultures of the same injected into the vagina of pregnant mares produced abortion, with arthritis in the aborted foal."

There is no doubt that the disease is of bacterial origin; the great question, is "What organism or organisms are the cause of it, and how do this or these organisms gain access into the system?"

I am of opinion there is a specific organism which, in all probability, belongs to the facultative group. This organism may in some instances act alone; *e.g.*, lameness, and no suppuration of joints; although certain changes have taken place, along with the pyogenic ones, then suppuration, termed mixed infection. The organism in most cases, at the onset of the disease, gives rise to metastatic lameness resembling at first somewhat that of rheumatism. Might this specific organism be closely allied to that of rheumatism? Then, again, if I may put it so, both these bacteria appear to have a special affinity for articulations, setting up various forms of arthritis.

In the case of joint evil, suppuration is sometimes set up, with its results. The specific organism of joint evil is the primary cause here, while the ordinary suppurative ones, viz., *S. pyogenes aureus* and *S. pyogenes*, &c., are secondary.

We may have a mild case, where lameness moves from one joint to another, no pus being formed, and the attack passing off, may, or may not, leave evidences of its presence, in the shape of bog spavins, thorough-pins, luxation of patella, &c.

We are always told that the bacteria enter at the navel, and what more natural than to blame this site, which, just after birth, is a very

open wound. In my humble opinion, too much stress has been placed upon this site, and other sites neglected, as the means of access. In some cases the umbilicus is shrivelled up in a perfectly healthy and normal co dition, and yet we have a case of joint evil, although we know the organisms could have entered prior to healing of umbilical wound. If this was always the channel of entrance we should expect the umbilicus to be in almost every case abnormal, but this is not so. Far from it. Then, again, we have some foals, with a pervious urachus (which is sometimes difficult to close), even in a suppurative condition, which never take the disease, although I must confess some of them do. A pervious urachus used to be looked upon by some as the first symptom of joint evil. If the point of entrance was always the navel the umbilicus would be oftener affected than it is. I do not deny that bacteria do not enter at the navel in some cases.

We must now turn our attention to some other means of entrance. Do organisms enter *per os*?

In the first instance are they gathered from the litter into dam's mammary gland, and thence sucked by foal along with the milk; and thus offspring may become infected that way?

Then, again, does the foal become affected *in utero*, or more possibly is it affected in "the passage" during delivery?

Some mares have diseased foals year after year, which fact has led some breeders to declare it to be hereditary. I do not go so far, but I think there is a great predisposition on the mare's part; neither do I hold the sire blameless.

These organisms, when once gaining the system, travel by the blood or lymph stream, more probably the former, until they arrive at their favourite site, viz., articulations, although I have seen abscesses in the intercostal space. If it were the ordinary suppurative organisms, I think the lymphatic glands throughout the body would be oftener affected than they are. We would expect the glands to be affected before articulation, but this is not the case.

The period of incubation is twenty-four hours to twenty-one days; may be up to forty-two days.

I delivered shire mare of colt foal, ligatured umbilical cord with antiseptic silk, and dressed parts with corrosive sublimate solution, 1 to 500; foal took joint evil on the third day, died on the tenth; stifle and both hocks affected, umbilical wounds normal. Am confident foal was contaminated during delivery, or infection was sucked along with the milk.

Another case was in a nag foal; the umbilical cord was ligatured

with silk, dressed with corrosive sublimate solution, 1 to 500; in fifteen hours foal drowsy: dead lame in near elbow; died before it was thirty-six hours old. *Post mortem*, widespread gelatinous exudate surrounding elbow-joint, umbilical vein filled with coagulated blood. In this case I should say infection occurred before birth.

The following are given as predisposing causes, some of which may have lowering influences: "Cold, wet, damp weather, by lowering vitality, ligaturing cord too far from abdomen, dirty ligature, ligature too thick, dirty hands of operator, ligature too loosely applied, dirty foaling box, box previously occupied by joint evil patient, metritis cases, strangles patient, raw condition of umbilicus owing to cord breaking off too near body, dirty navel by contact with mare's vagina, or litter, may be affected *in utero* because joint-evil and abortion often occur together."

According to the late Dr. G. Fleming, the following are given as predisposing causes:—admission of air or foreign matters to the interior of umbilical vessels, bruises or injury to the umbilicus either during birth or afterwards, irritation of the part either by the litter, manure or urine, the habit which certain females have of licking the umbilicus of their progeny, or of young creatures to suck the remains of the umbilical cord of each other, rupture of the cord close to or within the abdomen, improper aid given to mother, exposure to cold or wet.

Symptoms.—In very young foals up to about three days, the first thing noticed, before even lameness, are dulness, no life, hurried breathing, sweats, temperature 104° to 106° F., hard, accelerated pulse, mouth hot and dry. In a very few hours the patient falls lame in one or more joints, and gradually merges into a case of joint evil. Foals older than about three days, left apparently well at night, next morning may be noticed to be lame in a limb. In some instances owner imagines foal has been trodden upon by mother. Perhaps before many hours lameness has left that limb and appears in another, the lameness at this stage resembling somewhat that of rheumatism in being metastatic. Joint slightly swollen, hot and painful, foot elevated from ground usually, temperature 103° to 106° F., pulse quick and hard, respirations hurried, mouth hot and dry, bowels constipated, foal stiff when moved about, but still sucks. At this stage it is wise to examine umbilical region. We may have an open urachus—patent urachus—but this is not always the case. When the foal urinates, instead of urine passing by urethra, the natural course, a few drops, or even a stream, may pass by urachus. This occurs both in male and female. The urachus

is a fœtal structure, which should lose its function after birth as a channel, and become one of the ligaments of the bladder.

We may have cases of patent urachus, even to a suppurative condition of umbilical region, which never develop into joint evil. Joints most commonly affected are stifle, hock, elbow, shoulder, hip, knee, and fetlock; latter two not often.

As the case proceeds, lameness increases, often settles in a particular articulation, and becomes a severe case, very painful, more swollen, and begins "to point" in the course of time. There is more chance of a recovery when it settles in a joint, and stays there. In a mild case, joint swollen, painful and hot but no suppuration, if in hock terminates in bog spavins and thorough-pins; in stifle, terminates in luxation of patella "stifled." In a chronic case, temperature, pulse and respiration remain elevated, hair easily pulled from mane and tail, animal lays a great deal, great difficulty in getting up to suck, bedsores, suppuration at various articulations, sunken eye, greatly emaciated. Resolves itself into a case of pyæmia, or empyæma, goes from bad to worse, until it becomes a pitiable object, and either is destroyed or dies from exhaustion. Mortality, 50 to 80 per cent.

Prevention.—First of all attend carefully to foaling box. Clean all old litter out, and swill floor with hot water, to which has been added Jeyes' fluid, or any solution of that series, or a solution of copper sulphate. Boxes in the country are not usually paved; sprinkle floor with solution of Jeyes' fluid or chloride of lime. If case of joint evil, strangles, or metritis, has been in previously, do not use it that season, rather let it stand idle, and clean out ready for next season. Place clean straw on floor, and sprinkle this with some solution like the previous.

If the weather is fine, mares are better foaled outside, in a grass field. If umbilical cord (which consists of urachus, two arteries, one vein, and Wharton's jelly) breaks, which it invariably does at the weakest part, paint raw stump with solution of corrosive sublimate, 1 to 500, every day for three or four days, or pure carbolic acid may be used, or paint with corrosive sublimate solution. Then on top of this paint with a mixture of collodion 7, salicylic acid 1. If the umbilical cord has not broken, ligature with piece of antiseptic silk, about ½ in. from abdomen, tying ligature as tight as possible. The operator having previously washed his hands in some water containing any disinfectant (these things are not always within reach at the majority of cases), cut cord off about ½ to ¾ in. below ligature, at same time paint cord and stump with 1 per cent. solution of corrosive sublimate, also with a mixture of

collodion and salicylic acid; or leave out collodion mixture and paint stump daily with corrosive sublimate solution for three or four days at least. Some veterinary surgeons use carbolic acid, 1 to 20. I hardly think this is strong enough, as it keeps cord very "moist," whereas corrosive sublimate "shrivels" it up like parchment, and keeps it in a dry and leathery condition. Should we have any signs of a "moist umbilicus," clean region first with warm water containing any antiseptic, paint all around umbilical region with corrosive sublimate solution, then dust in oxide of zinc and copper sulphate, equal parts, daily for a few days. If weather is good, get mare and foal out to grass as early as possible, if only for a few hours daily. Do not turn mare and foal out along with another foal that is affected with joint evil, or even with a strangles patient.

Some umbilical cords are tied too low down and not tight enough, and some ligatures are too thick. Wash mare's mammary gland, thighs, hips, vulva, tail, &c., with a 5 per cent. solution of boracic acid, or a 5 per cent. solution of thymol, commencing a few days before she is expected to foal. Wash mammary gland before foal is allowed to suck, also for a few days after foaling with same solution, especially if mare has bred joint evil foals previously. This should be religiously carried out. There is not enough care bestowed upon these parts, and too much on navel. Give mare regular exercise before foaling.

Treatment.—If first symptom is an open urachus we must attend to that first. Cast patient on left side; wash umbilical region in warm water containing either Jeyes' fluid, lysol, chinosol, &c., &c., at the same time removing all *débris.* After this, some veterinary surgeons apply one of the following: lunar caustic, actual cautery, cantharides, blister, corrosive sublimate solution, 1 to 500 or 1 to 1,000—the latter I do not think strong enough—pure carbolic acid, or 1 to 20 in glycerine, or olive oil, salicylic acid 1 part, and collodion 7 parts, sulphate of copper and zinc oxide, equal parts.

The idea in most instances is to set up inflammation, with all its sequelæ, cause swelling, and thus close the orifice, converting the urachus into a fibrous cord. Have seen some odd ones, that no kind of treatment closed up, they ran in spite of everything, and only ceased to run when they were turned out to grass, and they never had joint evil, the "cure," I think, was due to change of environment.

Some veterinary surgeons place two large pins through remains of cord close to body, at right angles to each other, and above pins wind around antiseptic silk, firm, but not too tight; but in some instances this sloughs away in the course of a few days without accomplishing

its object. As soon as foal goes lame, if it is not in good surroundings, place it in such. If foal is unable to get up, have it lifted up frequently; do not let it stay down too long. By this means it sucks more frequently, does not get stiff; no bedsore, empties bladder and rectum.

Should weather be anything like fine, get them out to grass, if only for a few hours in middle of day; if storms come on, then they must be brought in. If bowels are constipated, give enematas of glycerine. I think this better than giving castor oil *per os;* if you give the latter, warm the oil first. As regards drugs, we all know the very young do not stand much. The following have been all tried and much vaunted: Quinine sulphate, Easton's syrup, salicylic acid, salicylate of soda, hypo-sulphate of soda, cod-liver oil, lime-water, iodide of potassium, binioide of mercury. Many assert there is nothing to beat 1 gr. of the latter, given night and morning.

With the joints rub in camphorated oil, belladonna liniment, arnica and aqua saponis, and a solution of iodine: each person has a preference for one or another of above. If they do not look like responding, foment with warm water, rub as dry as possible, and then apply one of the above dressings. If joint looks like suppurating, apply a mild biniodide blister to the part; poultices are worse than useless. When abscess "points," rather allow it to burst than open it; pus is turbid in appearance, has a peculiar fœtid and characteristic odour, and sometimes contains flakes of lymph-like material. Syringe cavity out with warm water containing chinosol, lysol, &c., twice daily, at the same time keeping surrounding area clean.

"At the commencement of the malady foals two to three weeks old have received 10 c.c. daily of antistreptococcus serum to 5 c.c. or less, as soon as resolution is established, continued throughout illness; 5 c.c. to 10 c.c. given as prophylactic on eighth and fifteenth days."

I have given a hypodermic injection of ½ c.c. liquid antistreptococcus serum polyvalent daily at the commencement of the attack. Candidly I must confess it acted like the other so-called specific; some recovered, whilst others died. My experience with the serum has been like that with the drugs, nothing to boast about.

I cannot see what great effect the serum can have in the disease until the definite organism of the disease has been isolated, but with a disease like this we are glad to give anything a trial. It is really surprising how some cases will stagger in and improve with very nearly any sort of treatment, whilst others will succumb after no end of careful attention and the best of hygienic surroundings. I really think recoveries are oftener in the common-bred animals than

in the well-bred ones. Sex has nothing to do with it. It is of little use commencing treatment if abscesses have already formed.

Post Mortem.—This greatly depends on how far the disease has progressed. If in an advanced state, great emaciation, remains of abscesses, pus found in region of various joints. Umbilical region may be normal or abnormal; if the latter, slightly enlarged, matted with pus, and scalded in region of thighs with urine. Upon removing skin over affected parts, a variable quantity of gelatinous material is seen, or purulent pus in suppurative arthritis. The pus varies a great deal in amount, has a peculiar appearance and characteristic odour which is difficult to describe; it also contains flakes that resemble flakes of coagulated lymph. Upon disarticulating the joints, capsular ligament inflamed and easily ruptured. Pus may or may not be present within the articulation. Synovia invariably increased in quantity, turbid in appearance; flakes may be present; synovial fringes enlarged and inflamed. Articular cartilage reddened, may be eroded, and easily pared with a knife; granulations commencing to form in small islands in cartilage. Tendons and ligaments in affected region inflamed, easily torn from their attachments and macerated. Abscesses in internal organs varying in size from a pea upwards, chiefly in liver, kidneys, spleen, and lungs. Umbilical vein in its course to liver may consist of a chain of abscesses, or more often a jelly-like material. Abscesses in umbilical vein are not as often found as some veterinary surgeons imagine, and when found, I am of opinion umbilical vein was not affected primarily, but secondarily. In many instances I have found vein normal. It resolves itself into a case of pyæmia and empyæma.

This is a disease largely met with in an agricultural, and especially a horse-breeding, district, and to a certain extent the bane of the horsebreeder of this country. I cannot call to mind seeing a case of joint evil in the Western States of the United States of America, where hundreds are foaled out in the open air, practically in a semi-wild condition, and never under cover. After paying service fees, keeping dam waiting practically twelve months, we get an offspring which is carried off by this disease, or practically rendered useless. At the same time, it is a very unsatisfactory disease for the veterinary surgeon to treat. If the animal recovers from the disease, in a number of cases it is little better than a "screw"-bog spavins, thorough-pins, enlarged hocks, enlarged stifles, luxation of patella, enlarged fetlocks. I almost think it comes next to contagious abortion in importance as far as a breeder is concerned, and yet very little attention is paid to it.

Clinical Articles.

SOME SURGICAL CASES

By D. DEY, G.B.V.C.

Lecturer on Bovine Medicine and Surgery in the Bengal Veterinary College.

I READ a statement recently in one of the veterinary periodicals that the British practitioner's opportunities of performing surgical operations is somewhat limited, and that owing to cost of treatment the animals are very often slaughtered. In Bengal, operative surgery is a subject in which we are compelled to be experts, because a very large number of our clients will not allow their animals to be killed, for religious reasons ; and, while they do not object very much to expense of treatment, they would turn their animals out to die sooner than have them killed. It necessarily follows that we undertake constantly operations which an English practitioner is very rarely called upon to perform. To show how different our practice is from yours, I have taken Colonel Raymond's permission to send to you a short summary of a few ordinary cases which I presume would have been killed in England and probably used for food.

1.—A Fibro-lipoma on the Forearm of a Cow.

The patient, a well-bred Montgomery cow, about six years old, was admitted with a tumour on the left forearm from which a quantity of serous fluid constantly dripped through a big sinus. The neoplasm was first noticed two years previously as a very small wart-like growth ; its size at the time of admission is depicted in Fig. 1. This cow, which had been formerly a very strong animal and a good milker, was extremely emaciated in consequence of the bother and pain caused by the growth.

Having obtained the owner's permission with some trouble, it was decided that an operation should be performed at once ; therefore under full anæsthesia and antiseptic precautions, tourniquets were applied, and the whole of the tumour, which was lying between the flexors and extensors of the knee and foot, was dissected away through an elliptical incision made for the purpose ; the hæmorrhage was slight and easily controlled. The wound was closed and a boric compress was applied.

Next morning the animal was off her feed, and the temperature had risen to 104° F. A febrifuge with aconite was prescribed. On the sixth day after operation, the temperature, which had remained

FIG. 1.

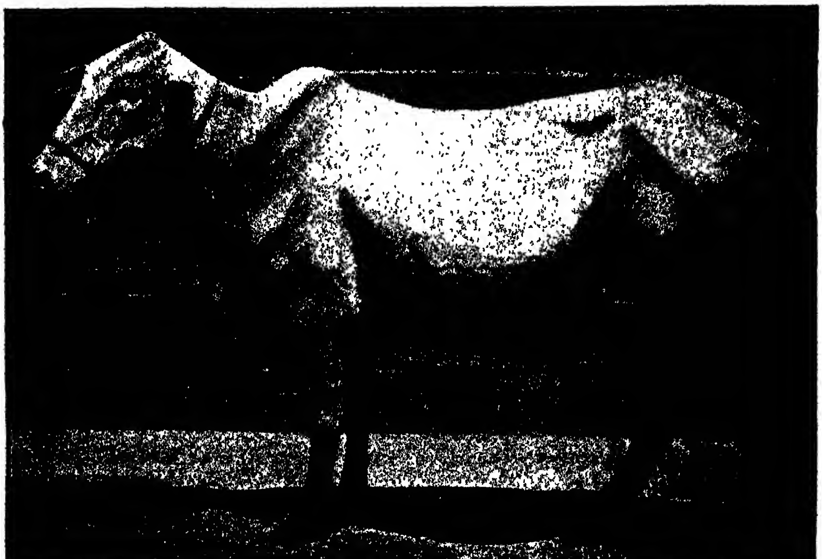

FIG. 2.

high, became normal, the animal took her usual diet and appeared bright. The wound healed by first intention.

Fig. 2 shows the animal at the time of her discharge from the infirmary. It will be noticed that her appearance has quite changed, and she would not be recognized but for the suture marks which are present on the left forearm. She was very brindled and thin when admitted, and she went out greyish-white in colour and fat. The tumour, which weighed 9½ lb., was found to be a fibro-lipoma.

II.—Mammary Abscess in a Cow.

A cow, with a large mammary tumour, very hard and tense, was brought to the infirmary for treatment as an out-patient. The owner,

who had been treating the animal himself, said the swelling commenced about a month previously and went on increasing in size despite all his domestic medicines. The cow was a fairly heavy milker, but had wasted away and looked emaciated.

The tumour was found to consist of an abscess affecting the two quarters of the right side. After the animal had been photographed, the legs and area of operation were shaved and washed thoroughly.

The whole of the affected quarters were carefully dissected out. The wound was thoroughly cleaned out and disinfected and sutured; boric compresses applied with suspensory bandages.

The following morning the temperature was 104·4° F. and continued high for four days, after which it remained normal. The wound in the meantime was washed out with creolin solution and dusted with boric acid daily. Owing to the profuse discharge the treatment was changed on the sixth day for a lotion of sulphate of zinc used with a syringe, but the outer wound was dusted with boric acid.

After the tenth day the discharge became much less and the animal began to pick up. The wound progressed satisfactorily and the patient left the hospital two and a half months after admission with two sound quarters. Fig. 3 represents the animal before operation.

The tumour weighed 16½ lb.; on section it was found to contain a mass of cheesy inspissated pus and the gangrenous remains of the gland which was made up into a ball. Microscopic examination of the pus revealed cocci of various forms.

III.—Amputations.

We perform amputations on all manner of animals from horses to birds; the following two are ordinary samples.

(1) *Amputation of a Ram's Leg.*—A pet Chinese ram of the fat-tail sort was admitted on the morning of November 9, 1908, with a compound comminuted fracture of the right hind leg at the proximal extremity of the tibia, having been run over by a railway carriage. There was a lacerated wound on the upper third of the thigh leading to the fractured tibia, the lower fragment of which was protruding; there was much comminution of the bone and laceration of the soft parts. Below the lesion the limb was discoloured, cold, and pulseless, but there was no line of demarcation separating the dead from the live portion. The animal was suffering badly from shock.

A stimulant was given and strychnine injected hypodermically; from the hip down to the fracture, the limb was shaved, thoroughly washed with soap and warm water, then with equal parts of ether and alcohol, and then thoroughly disinfected with perchloride of mercury lotion. On account of the low condition of the patient, A.C.E. mixture was used as anæsthetic instead of chloroform. The limb was made bloodless and tourniquet applied. Two equal flaps, anterior and posterior, were made, the lower end of the flaps being well above the wound so as to avoid including any unsound portion. The soft tissues were cut through and the bone sawn above the base of the

FIG. 4.

FIG. 5.

flaps, the principal vessels were ligatured with catgut before removal of the tourniquet, a few smaller twigs which were found bleeding being secured afterwards. Hæmorrhage having stopped completely, the wound was closed with interrupted sutures. The temperature, which was high on admission, came down and became normal on the fifth day; the wound healed by first intention; the sutures removed on the tenth day. Fig. 4 represents the case after recovery.

(2) *Amputation of a Deer's Leg.*—The animal, a young deer, was admitted in a semi-conscious state, with a compound comminuted fracture of the right hind leg at the middle third of the metatarsus, caused by a fall from the terrace of a house. The limb was so badly damaged that conservative treatment was out of the question. The animal was anæsthetised and the limb was amputated with all the precautions mentioned in the former case, the circular method being adopted, as it was found in this position to be more convenient. The animal made a good recovery and left the hospital in three weeks. Fig. 5 represents the animal after recovery.

IV.—Laparo-hysterotomy in a Cow.

We do a very fair number of Cæsarean sections in ruminants, canines, and felines. Unfortunately many of our larger obstetrical patients are brought in such an exhausted state, and the uterus and the fœtus are in such a mutilated and septic condition, that surgical intervention is practically hopeless.

The patient, in the case under report, a well-nourished primi para cow, was admitted with urgent symptoms of dystokia. On examination *per vaginam* the fœtus was found alive occupying the right horn of the uterus and presenting the sternum and the abdomen. As it was impossible to extract it whole, owing to its size, and as the mother was in good condition, the uterus not having been apparently injured by repeated examinations and unsuccessful attempts at delivery, it was decided to perform Cæsarean section.

The animal was anæsthetised with chloroform, and prepared in the following manner, with the additional precaution of cleansing and disinfecting the vagina. The triangular space covered by the transverse processes of the lumbar vertebræ, the posterior border of the last rib and the anterior spinous process of the ileum on the right side, was thoroughly shaved, washed with soap and warm water, scrubbed with equal parts of ether and alcohol, and disinfected with alcoholic solution of mercuric chloride. Having prepared the operation field, a longitudinal incision of 12 in. was made in a direction downwards and

forwards so as to correspond with the fibres of the oblique muscles; the subcutis, external and internal oblique and transverse muscles of the abdomen were quickly incised. The wound was kept open by two retractors held by assistants and the hæmorrhage controlled by compression, then dividing the parietal peritoneum the abdomen was reached. The right hand, wet with warm boric solution, was introduced in the cavity and the uterus was brought opposite the incision, care being taken to avoid injuring the intestines. Two assistants with clean and antisepticised hands pressed the sides of the wound against the uterus; then the visceral peritoneum and the longitudinal and circular muscular fibres of the uterus were divided. The fœtus was found alive enveloped by its membranes within the uterus; these membranes were carefully punctured with an aseptic trochar and cannula, and the contents were allowed to escape outside the abdomen; a slit was made through the membranes and enlarged, and the live fœtus was brought out through the abdominal wound.

Having delivered the fœtus, the umbilical cord was clamped in two places, between which it was divided, and subsequently a ligature with sterilized catgut was applied to the stump. Then the fœtal membranes with the placenta were removed through the wound after detaching the fatal cotyledons from the maternal ones. A few minor twigs of the uterine wall were pressed by compression forceps. The cavity of the uterus was then thoroughly cleaned with a sterile sponge wetted with warm sodium chloride solution. The uterine wall was sutured with sterilized catgut with the edges of the wound being inverted so as to bring the peritoneal surfaces in contact. Next the abdominal cavity was cleaned with warm salt solution, and the muscles were stitched with sterilized catgut; a drainage tube was inserted between the skin and external oblique muscle, and the skin was closed by interrupted sutures of silkworm gut. This part was thoroughly wiped with a biniodide of mercury solution and subsequently dried with dry aseptic sponges and gauze; iodised collodium was applied over the stitches, and iodoform gauze was applied under a generous boric padding and bandaged with firm pressure. The animal suffered from shock and the temperature was high next morning, but a febrifuge was given, and the strength of the patient was supported with nutritive gruels. The milk secretion was drawn off regularly. On the tenth day the animal regained her appetite and commenced to graze; the bandage was then dispensed with and the wound was covered with collodium and iodoform. Most of the sutures held and were removed on the twenty-first day. There was practically no

vaginal discharge during the course of treatment. The animal left the hospital within a month, making a complete recovery. The calf only lived for three days.

In concluding, I may say that in a climate like that of Calcutta, surgery with our patients presents difficulties which are not found in the same degree in some other places, but local experience teaches us how to combat these troubles to a large extent. For instance, it used to be considered that a castration case could not do well in the rainy season, but we find that we are quite as successful then as at any other time. Our chief annoyances are due to insect carriers.

A PECULIAR MONSTROSITY IN A HEIFER.

By AINSWORTH WILSON, F.R.C.V.S.,
Witham, Essex.

THE subject of this note was a full-time shorthorn heifer, in capital condition, one of a large batch which I had subjected to the tuberculin test three weeks previously.

On my arrival at the farm I found that she had been in labour some hours, the pains were normal, and her strength well sustained. On examination I found one foot, a hind one, presented at the vulva ; two others, a hind and a fore foot, lay in the anterior portion of the vagina ; the cervix was almost filled up by the protruding hind limb, barely admitting the hand into the uterus.

A rope was slipped over each fetlock, and an unsuccessful attempt was made to push back the hind limbs, and by traction on the fore limb to reach the head. Alternative attempts to repel the fore limb and to bring the hind ones into position revealed a remarkable state of affairs. Each time traction was exerted, the three limbs, together with the tail, advanced simultaneously, in spite of efforts to the contrary.

I was led to suspect the presence of twins, or a possible mistake in the identity of the limbs—at this stage the existence of a twisted fœtus did not occur to me. After some time it became possible to push back the protruding hind limb some 12 or 18 in., enabling the hand and arm to enter the uterus ; the nose came just within reach, and a little traction on the fore limb allowed the slipping of a noose on the lower jaw ; later on a blunt hook was inserted in the eye-socket. Then two or three ribs, denuded of skin, could be touched with the tips of the fingers.

Delivery of the fœtus *in toto* being impracticable, embryotomy was resorted to. The protruding hind limb was removed subcutaneously,

not without great difficulty, inasmuch as the hock could not be advanced further than the vulva. A ventral transverse presentation was now discovered to exist, the fœtus lying jammed across the uterus, the limbs, tail, and head all close together in a heap, as it were. Neither the remaining hind limb nor the head and fore limb could be brought into the passage, while it was evident that some growth or covering enveloped them close to the trunk; the nature of this envelope was not apparent at the time.

At this stage I informed the owner, a gentleman farmer, who was rendering every assistance, that we had apparently a twisted monster to deal with, and that its delivery or further reduction in size was beyond my powers—this after ineffectual efforts to bring the mass within operative reach and to slit up the sheath or covering. Permis-

Monstrosity (Mr. A. Wilson's case).

sion being obtained, I thereupon killed the heifer. After she had bled properly, an incision was made along the median line and carried downwards to the pelvic symphysis; the saw for the bone, and the knife for the vagina and uterus, soon exposed the exact position and the abnormal characteristics of the calf. The latter are shown more or less clearly in the two photographs (for the photographs the amputated limb was replaced in position). They may be summarized as follows; Ventral transverse presentation; double spinal curvature, like the figure S; the four legs, head, and tail close together, and over them is reflected a large pouch of skin, the hair forming the inner lining of the pouch; the humerus of the hidden fore-leg is situated

anteriorly; the fœtal body cavity is absent, the ribs of each side being closely applied along their entire length. The specimen resembles the *Schistocormus reflexus*, illustrated in De Bruin's "Obstetrics," and reproduced in other works. It is, no doubt, a form of schistosoma; but it must be observed that here one fore-leg is dwarfed and completely hidden at the bottom of the pouch; it completely encircles the neck just behind the ears. Lastly, the viscera are seen lying free at the posterior border of the trunk, to which they are attached.

Remarks.—This case is yet another example of curious abnormality in fœtal development. It illustrates one of the difficulties, fortunately of rare occurrence, with which veterinary obstetricians have to contend, besides, perhaps, possessing a certain educational value. For these reasons I am induced to record it

Monstrosity (Mr. A Wilson's case)

In any form of twisted spine, with little room in which to work, it is by no means easy to dispel the suspicion of twins from one's mind. Serious dystokia is present, and the condition for a time is very puzzling. Once the existence of a single fœtus is established, the familiar text-book formula, "Reduce the size by embryotomy," is often inapplicable, and one has, perforce, to accept the inevitable.

It may be of interest to state that the monster was perfectly fresh; death had apparently occurred some four or five hours prior to operation.

Professor W. L. Williams ("Obstetrics," 1909) remarks that in his cases putrefaction and emphysema of the fœtus preceded the symptoms of dystokia.

SOME NOTES FROM PRACTICE.

By G. MAYALL, M.R.C.V.S.,
Norwich.

I. Eversion of Rectum in a Sow.

I was called to a sow, aged 2 months, that had everted her rectum, on December 10, and found 4 in. of the organ out. I sutured the rectum with five silk sutures close to the anus, cut off the protruded portion of gut with knife and scissors, and returned the stump well into the passage. I then ordered the sow to be fed on skim milk and bran, and separated from her companions for a time, and kept warm and dry. She has done well.

II. A Curious Sequel to Strangles.

A chestnut cart-horse, after recovering apparently from an attack of strangles, held his head on one side and showed great pain over the region of the right eye. From the back of the eye a purulent discharge escaped very quickly when the eyeball was moved from the inner canthus. There was no swelling about the forehead or near the eye; but the horse flinched and shook his head on pressure in this region. Mag. sulph. was given in the drinking water, and the eye and its neighbourhood bathed with warm, weak solution of mercuric iodide, and afterwards lead lotion. In a fortnight pain was gone, and discharge too; and the horse, after three months from the first attack of strangles, is at work. I am quite unable to say what the state of things was here, or what caused the pain and discharge, unless it was pressure of pus on the optic nerve and lodgment of some catarrhal discharge at the back of the eye.

III. Pneumonia after Fistulous Withers.

Attended a case of fistulous withers in a hunter, which appeared to be lymphomatous. He was an old horse. Gave iodide of potassium internally, and externally massaged the swelling with pot. iodide with liquid soap, and applied warm fomentations. In a fortnight the swelling had greatly increased, and was opened, giving exit to a lot of flocculent material and dirty-coloured serum. The cavity was well injected with tincture of iodine, and a plug soaked in the same inserted. afterwards syringed out with zinc chloride. Iodide of potassium was still given internally. The animal was going on well when, as he was not of much value, and in order to make room for another sound knight of the chase, and contrary to order, he was shifted into a bullock yard, where some fresh manure had been turned over. Two days here brought on septic pneumo-pleurisy as a complication, and he was ordered to be destroyed.

Canine Clinical Notes.

A FEW NOTES FROM PRACTICE.

By G. MAYALL, M.R.C.V.S.
Norwich.

I.—Luxation of the Eyeball.

A pug-dog brought in on October 3, 1909, had the eyeball out of its socket about an inch. He had been fighting with another dog, and thus got it displaced. The globe was not wounded in any way. After cleansing with lukewarm solution of hydrogen peroxide the eyeball was put back, but it did not remain in its place easily, and before this could be accomplished the eyelids had to be kept closed over it for about ten minutes, and then cold water trickled over the outside of the eye. I was doubtful whether the eye would remain in its place during the night, but was pleased to find in the morning that it had not been everted again, but as a precaution told the owner, who wanted the eye saved if possible, that it might have to be removed.

Although on the morrow the member was in its place, the sclerotic on the inside of the eyeball was tumefied, prominent, and injected. I applied a fairly strong solution of protargol to it with a brush, and this condition gradually improved. The dog was discharged at the end of a week, and the owner a fortnight later said that the eye was normal in appearance, and that the animal was able to see with it. I treated the pug within about an hour of the accident, so was favoured in that way.

II.—Extensive Accidental Wounds.

A sheep-dog was brought to me on September 28, having got into the reaper, and both fleshy parts of the forelegs about 4 in. below the end of the humerus and at the front of the radius were cut to the bone. The wounds were incised ones. The paw and carpus of the left fore leg were bent back, and the dog could put no weight on the limb.

I clipped the hair off in proximity to the wounds, cleansed the skin and cuts with antiseptic, sutured the muscles and skin with iodoform tape sutures, these being only in one row, and going right through the extensors and skin. Six were put in one leg and four in the other, and in addition an extensive skin wound in the flank was sewn up.

The dog was kept in the infirmary six days, at the end of which time the owner took him home. He recovered, and is now doing well. Had he not been a great favourite with the owner, a farmer, he would have been destroyed rather than treated.

III.—Recurrent Eversion of the Uterus.

A bull bitch everted her womb for the third time this morning, January 2, 1910. It was out 2 in. further than on previous occasions when I have returned it. After cleansing the organ with a cold solution of mercuric iodide, and working at it five minutes, I managed to return it. The eversion of the uterus seems to occur periodically at the time of coming in œstrum, but it could not certainly be said that this was the case on this occasion. She is an old bitch, and has put out her womb on three occasions during the last eighteen months. This time the organ outside the vulva was as big as one's fist in size, tumefied and congested.

Miscellaneous.

UNIVERSITY OF MELBOURNE.

We are very pleased to announce that Mr. S. S. Cameron has qualified for the degree of Bachelor and Doctor of Veterinary Science of the above University. It is interesting to note that this is the first degree of Doctor of Veterinary Science issued by a British University, although such degrees have been issued by Continental and American Universities for some time past. The theses for which Dr. Cameron was awarded his degree included contributions upon hereditary unsoundness in horses, pleuro-pneumonia contagiosa of bovines, epizootic amblyopia in horses, and tuberculosis in animals and man. The examiners were Professor Allan, Dr. J. W. Barrett and Dr. Cherry.

Samuel Sherwin Cameron qualified as a Member of the Royal College of Veterinary Surgeons in May, 1888, having taken out his course at the New Veterinary College, Edinburgh. He is now Chief Veterinary Officer of the Department of Agriculture, Melbourne.

FOOD CONGRESS AT PARIS, 1909.

In connection with the Congress which was held in Paris in October last, a beautiful medal, from the design of Daniel Dupuis, has been presented by the White Cross Society of Geneva to Mr. Loudon M. Douglas, of Edinburgh, who acted as Honorary Secretary to the English-speaking Section of the Congress.

Abstracts and Reports.

TICKS AND TICK-BORNE DISEASES.

By Dr. A. THEILER, C.M.G.

Government Veterinary Bacteriologist, Transvaal.

The diseases which are tick-transmitted in South Africa may be classified into two groups. One, in which the immune animal retains the infection in the blood, in other words, in which the recovered animal acts as a constant reservoir for the virus; and the second group where the blood of a recovered animal becomes sterile and therefore harmless. The former fact explains the reason of the constant infection of African veld by red water, biliary fever, and gall-sickness. The animal which recovers from the disease acts as a host for the ticks. The ticks become infected with the parasites, and in turn carry them back again to the animal. In this way a circle is formed between the animal, the cause of the disease, and the tick. The tick and micro-organism of the disease are dependent on the animal; without the animal their life-cycle would finish. They require the animals for the multiplication of the species, and accidentally, through the invasion of a great number of parasites, such an animal becomes sick and may die.

An adaptation between the animal and the micro-organisms results, by which both benefit, the animal with its immunity and the parasite with a permanent home. It can be deducted from these facts that the disease would have to disappear if we were able to break the circle by removing either micro-organism or tick, as the life-cycle would naturally come to a standstill. It must be reasonably expected that the easiest thing to attack is the tick, but to attack it successfully its life-history must be properly explained.

The Life-history of the Tick.—The ticks belonging to the order of *Acarinæ* are easily recognized by the naked eye as flat bodies when not engorged, or more or less swollen when engorged with blood. We distinguish male and female in the adults, and male always remain flat, whereas the female engorges and grows in size; in this country the latter is usually known as the tick proper. Male and female meet on an animal, and after feeding they seek each other for copulation, and as soon as the fertilization has taken place the female engorges. Underneath this engorged female the male can usually be found. Before repletion the female is about the same size as the male. The presence of the small tick underneath the female, especially in the case of the blue tick, has led to the popular opinion that this is a young one. After the female has repleted herself she hides in the grass or in the sand. Soon after hiding away in this manner she begins to lay her eggs. This process of oviposition varies in length of time according to the season in which the ticks drop. After a lapse of a certain period the eggs begin to hatch, and the young larvæ appear; they are commonly known as seed ticks, and they seek their way to the top of the grass or bushes, from which they attach themselves to a suitable host which may be passing. So far the ticks with which we have to deal behave similarly, but the various species differ in their habits, and according to these habits we can divide them into three groups:—

(1) The ticks which, for the completion of their life-cycle, require only one host. To this group belongs the blue tick. It reaches the host as a larva; it moults (changes its skin) on the animal from the larval into the nymphal stage, and again from the nymphal stage to the adult stage. In the adult stage the sexes meet again, and the life-cycle begins afresh.

(2) Ticks which require two hosts for the completion of their life-cycle. To this group belongs the red-legged tick. It comes as a larva, it moults into the nymphal stage, and leaves the animal as an engorged nympha. The moulting process takes place in the ground from the nymphal to the adult stage, and the sexes meet again on the host.

(3) Ticks which require three hosts for the completion of their life-cycle. To this group belongs the family of the brown ticks, the black-pitted ticks, and the bont ticks. The larva reaches the animal and engorges, and, as soon as it has done so, drops to the ground, where it moults (after a lapse of a certain time) into the nymphal stage. The nymphæ seek a second host, also engorge, and, after repletion, drop to moult into the adult on the ground. The sexes seek a third host, where they meet, and the whole life-cycle begins again.

Of interest to us from our point of view are the dates required

(1) For laying the eggs.
(2) For the hatching into larvæ.
(3) For the completion of the life-cycle on the host in the case of the one-host animal, the blue tick.
(4) The time the larvæ and nymphæ require to replete on a host.
(5) The length of time the engorged larvæ and nymphæ on ground require to moult.
(6) The length of time the adult females remain on the host before they drop.
(7) The length of time these various ticks and stages of ticks may live.

Concerning these the following facts are known :—

Blue Tick.—The whole length of time this tick requires from larval to adult stage averages three weeks. From the third week the engorged blue females begin to drop, and about the end of the fourth week they have all left the host. In other words, when we remove an ox or a horse out of the veld and place it in a stable we must constantly expect during the four following weeks the appearance of blue ticks which have been picked up up to the day when the animal left the pasture. The female begins to lay her eggs about five days after she has left the host. This applies to the summer season only; in the winter it is postponed. The eggs hatch in the warmer season in about three to six weeks, and on an average after about thirty-six days; in the winter it will last a little longer. The young larvæ kept in glass bottles have been known to live six months; if they do not reach the host they die; on reaching the host they continue the life-cycle. During this time they sit on the grass; no food is obtained from the plant (as the popular belief is), therefore it follows that the blue tick must finally die, if after the above-stated lapse of time no host is found.

The Red-legged Tick.—The hatching period of the eggs of this tick

is in summer about thirty days as an average. We have known the young larvæ to live for a period of seven months. In the veld the young larvæ which find a host generally hide themselves in the interior of the ear and in the flanks, and soon begin to replete. They undergo the change from larvæ to nymphæ on the host. The nymphæ attach themselves near the place where the larvæ were, and replete themselves quickly, so that as early as ten days they may be replete and drop, but generally after an average period of fifteen days. The second moulting process takes place in the ground, and requires an average period of twenty-four days. In our experiments adult red-legged ticks have lived up to a year, and have after that time attached themselves to a beast; such longevity seems, however, to be the exception, and the usual period is less.

The Brown Ticks.—Under this name I include the Cape brown tick[1] and the shiny brown tick,[2] whose life-cycle is similar to that of the brown tick proper. In addition to these there are some more brown ticks which may act as carriers, but this has not yet been experimentally proved. The brown tick female, after it has been placed on a host, may be observed to drop already fully engorged on the fourth day, and by the end of a week it has usually left the host. The laying of eggs usually begins after six days. The hatching period averages in the warm season twenty-eight days; in the winter time the hatching takes several months. The young larvæ readily attach themselves to cattle and engorge rapidly, and may drop off the host in as brief a time as three days; after the lapse of eight days all engorged larvæ have dropped. The moulting process takes place in the ground, and averages twenty-one days. The shortest recorded period was sixteen days. The larvæ have in our experiments lived up to a period of seven months, and the nymphæ to six and a half months. For some days after moulting these creatures are not able to feed. They are colourless and weak, and refuse to bite if placed on animals. A few weeks later, however, they eagerly seek attachment when placed on the skin of a host. The nymphæ also require a period of about three days to engorge, and within a week have dropped off the animal. The adult ticks appear out of these nymphæ in summer-time after an average period of eighteen days. They, like larvæ and nymphæ, are almost colourless and very weak. A few days later they take the characteristic colour, become more vigorous, but require some time before they will readily attach themselves to a host. In our experiments the adults have been known to live up to a period of nine and a half months.

The Black-pitted Tick.[3]—The hatching period in this tick averages thirty days. The larvæ do not attach themselves readily to cattle or horses, but to other animals, and the intermediate stages are found on smaller animals. The first moulting usually takes place after twenty days, and the second one, from nymphæ to adult, after twenty-five days.

The Bont Tick.[4]—The female begins the laying of eggs in summer-time about two weeks after dropping from the host, but over three

[1] *Rhipicephalus capensis.*
[2] *R. nitens.*
[3] *R. simus.*
[4] *Amblyomma hebraeum.*

months may sometimes pass. The shortest hatching period is about ten weeks, but it may last as many months; it averages from four to six months. In our experiments larvæ have been known to live seven months. The young larvæ replete themselves on a host in from four to twenty days, and the majority always drop between the fifth and seventh day. The first moulting takes place after twenty-five days, but sometimes four months may pass. The nymphæ replete themselves on a new host in from four to twenty days. Nymphæ have been known in our experiments to live six months. The last moulting process takes place after about twenty-five days, the shortest, and one hundred and sixty days, the longest. The adult female drops from about the tenth to twentieth day after attaching. Adults have been known in our experiments to live up to a period of seven months.

The bont-legged tick[1] has not been discussed here as it has not yet been proved to act as a carrier of the disease.

Transmission of the Disease.—From the life-history, as outlined above, the following possibilities may be observed in the transmission of a disease.

Firstly, the transmission is effected by means of young larvæ, whose mothers have been sucking blood from infected animals. This has been known to be the case in redwater and spirochætosis; propagation of redwater by the blue tick is the principle modus; the larvæ of the brown tick may transmit redwater, and the larvæ of the red tick have proved to be hosts of spirochætosis.

Secondly, the transmission is effected by one of the succeeding stages, either by the nympha which infected itself as a larva, or by an adult which infected itself as a nympha. The red tick has been proved to transmit biliary fever of horses, spirochætosis, *Piroplasma mutans*, and *P. parvum* in the adult stage after it had been sucking blood of an immune or sick animal in the previous two stages. The group of brown ticks and the black-pitted tick transmit East Coast fever. It has been proved that the group of brown ticks and black-pitted ticks transmit the disease in their nymphal stage after they have been sucking blood from a sick animal in the larval stage. Further, the group of the brown ticks and the red-legged tick have been proved to transmit the disease in the adult stage after they have feeding in the nymphal stage on a sick animal. The adult brown tick has also been proved transmit *P. bigeminum* of redwater and *P. mutans*. The bont tick has been shown by Lounsbury to transmit heartwater in the nymphal stage, and in the adult stage after the larval and nymphal stages were fed on sick animals. It has further been proved that, contrary to the experience in East Coast fever, the brown tick can pass its nymphal stage on an animal not susceptible to heartwater without losing the infection it acquired in the larval stage, and transmit it in the adult stage to a susceptible animal. This is not the case in East Coast fever, where experience has shown that a tick after it has once bitten an animal can no longer transmit the disease. It must be emphasized here that the popular opinion that ticks pass from one animal to another and communicate the disease in this way is wrong. The destiny of females is to lay eggs, and of engorged larvæ and nymphæ to moult, and this makes it impossible

[1] *Hyalomma aegyptium.*

for them to reach new hosts before they have reached the next stage; therefore, only *males* can pass from animal to animal and can transmit the disease in this way. Indeed, males of any species of ticks which we have mentioned can live for many months on a host, but their peculiarity is to remain on that host, which they only leave accidentally when they are rubbed off; and since experiments have proved that once they have bitten they become harmless, such an accidental change of host does not come into consideration in the propagation of the disease, at least in East Coast fever.

The Hosts of the Ticks.—From our point of view, it is all-important to know which animal, in addition to those of which we have considered the diseases, may act as hosts for the ticks, and the following notes have been recorded concerning this:—

The blue tick has been found on equines and cattle, sheep, goats, dogs, and antelopes.

The red tick has been found to occur on equines, cattle, sheep, and goats, the reedbuck, other antelopes, and the Cape hare.

The brown tick has been found on cattle, equines, sheep, and goats, dogs, on various antelopes, and the Cape hare.

The black-pitted tick has been found on cattle, horses, sheep, goats, dogs, on the wild dog, the jackal, bushpig, and the hedgehog.

The bont tick has been found on cattle, horses, sheep and goats, dogs, the wild dog, on antelopes, and the ostrich.

The Prevalence of Ticks in the various Regions of the Country and in the Different Seasons.—Generally speaking the ticks are more frequent in the summer than in the winter-time. This stands to reason, since a certain moisture and temperature is required for the process of hatching and moulting. The various species related are, however, not equally distributed throughout the various parts of the country. We may state that the higher the altitude and the barer the veld, the less frequent are the ticks, hence the bushveld is practically the home of the tick, and the name "bosluis," as given by the Dutch farmer, indicates this. The blue tick may be considered as the most cosmopolitan tick of South Africa, and is found at all altitudes. Next to it is the red tick, which is met with in the high veld, but less frequently. The group of the brown ticks, especially the brown tick proper, is rarely met with on the plateau of the high veld, but it may be found there in protected valleys where the vegetation grows higher.

The same applies to the black-pitted tick. The bont tick is limited to the bushveld proper, and occurs only in places where the real bush is met with.

The Number of Ticks in Proportion to the Number of Cattle.—Under the most favourable conditions the number of ticks increase directly to the number of hosts found on a farm, thus the more stock is kept the more the ticks will increase, and under such conditions the ticks may become so troublesome that, apart from their *rôle* as carriers of disease, they do an enormous amount of damage by the withdrawal of blood from the stock and by the irritation they cause, which is generally known as "tick worry." Indeed, the ticks can kill an animal without even transmitting a disease. This we have seen in an experiment of ours, in which a horse was infested with blue ticks and which died as a result of this infestation, from acute anæmia, owing to the withdrawal of blood. Within three days 14 lb. weight of blue ticks

were collected which had dropped off this horse, and this amount only represented about half of the ticks which engorged themselves on it.

Influence of Cold.—We have stated that the presence of ticks is unequally distributed over high and low veld, and it may be expected that this fact finds its explanation through the temperature to which ticks are exposed in the high veld. Indeed, it is generally admitted that such is the case, and it may be so, for when such ticks as thrive best in the low veld are brought to the high veld by the removal of animals, the engorged females drop off, but do not develop there. But the cold in itself is not a barrier in prohibiting the development of blue and red ticks in the high veld, as experience proves; the temperature of freezing point only retarded the moulting of the nymphæ into adults, but did not kill them; it did not effect the blue larvæ at all; these latter only died when exposed for some time to a temperature considerably below freezing point.

Eradication of Ticks and Disease.—The facts quoted above indicate the ways and means by which we shall arrive at the eradication of ticks, and with them diseases. From a practical point of view we shall consider the two points separately, the eradication of ticks and consequently the eradication of disease.

The eradication of ticks can be attempted in several ways:—

(1) *Burning of Grass.*—Up to the present time the burning of grass has always been considered to be of great help for the destruction of ticks, and it stands to reason that such must be the case. Farmers have always distinguished burning of grass in season and out of season, to which they attribute, if not properly carried out, the cause of various diseases, such as redwater and gall-sickness. I believe that these observations have a certain foundation. But, nevertheless, the great importance attached to it as the cause of disease is generally exaggerated. Burning of grass undertaken at a time when most of the ticks have hatched and moulted and are sitting on the top of the grass must undoubtedly destroy them.

We note that the principal tick season is the summer, and with the cold tick life is more or less at a standstill. The ticks which, up to the end of the summer, have moulted and are sitting on the top of the grass, will still fasten themselves on to a passing host, and they are responsible for the tick life which we notice during the winter months. During the cold weather the laying of eggs and hatching is prolonged; if, therefore, at the beginning of the cold weather burning is undertaken, we would only reach those ticks sitting on the grass, and not those which sit underneath. These latter would, under the influence of the sun on the bare veld, probably hatch quicker, and when the young grass is shooting up, they will be found on the top of this grass. When, however, the burning of the grass is undertaken later in the season it would probably destroy the majority of the ticks, and the later the burning is undertaken the better the results would be. But grass burning alone, although carried out in the proper season, will not eradicate all the ticks, it only reduces their number.

Cattle which graze over the same veld maintain tick life, and ticks buried in the ground and not affected by the fire continue the cycle.

(2) *Dipping.*—Dipping has been made use of, and is still being made use of, as a very efficient means of destroying ticks, and undoubtedly it is so wherever it is carried out properly with an effective

dip. For our deliberations we accept the condition that the ticks will always be killed when the dip reaches them, and therefore we do not enter into the details of the efficiency of any particular dip, but consider the question of dipping as a whole. In valuing the effect of dipping, we must take into consideration the life-cycle of the species of tick with which we deal, and from this we can determine whether a method of dipping will enable us to destroy certain species of tick or not.

We have stated that the *blue tick* requires three to four weeks for the completion of its life-cycle on an animal. It follows, therefore, that one dipping within that time, say every third week, is quite sufficient to destroy the crop of ticks collected during that time. The blue tick larvæ only live up to a certain number of months, hardly exceeding eight; within the eight months an animal would constantly pick up these ticks, and by dipping these would be destroyed, and finally the period would arrive when an animal would no longer pick up blue ticks; the young larvæ which have not reached a host would have died in the meantime. Thus dipping for the blue tick should have almost a certain successful issue, always provided that no tick escapes the dip.

Referring to the *red tick*, we find that in its life-cycle it seeks the host twice—once as a larva from which it moults into a nympha and remains there for about sixteen to twenty-one days before dropping; the second time as an adult, the female remaining on the host from six to ten days. It follows from this that a three-weekly dipping would not reach all the stages, and if it would be of any use for the destruction of the tick it would have to be repeated after at least every eighth day. Dipping continued in this way during the period the nymphæ, larvæ, and adults live in the grass, would finally lead to their eradication.

The Group of the Brown Ticks.—For the completion of their life-cycle they seek the host three times; as larvæ they replete in from three to five days. The same period is required as nymphæ, and the adult female requires about a week before it drops engorged to the ground. If the dipping is to be of any use for the destruction of brown ticks, it would have to be repeated every fourth day at least, and be continued as long as the intermediate stages can live in the grass.

In the case of the *bont tick*, which also requires three different feedings on an animal, the case is much similar to that of the brown tick. The larvæ remain on the animal from about four to five days, the nymphæ about the same period, and the adult about a fortnight. The dipping, to be effective, therefore, would have to be done at least about every four days.

From the above notes it may be seen that dipping as a *universal panacea* for the destruction of ticks must fail. It is impossible to dip any great number of animals every fourth day for a period of at least a year. *It will, however, be successful in the case of the eradication of the blue tick.*

(3) *Starving the Ticks.*—The third method of eradication of ticks is the starving process, and this must undoubtedly lead to success in every case where we are able to keep the place, for a sufficient length of time, free of such animals as act as hosts. We note that the blue tick will only live about eight months, therefore keeping a pasture free of animals for this period must starve out the ticks. If it is our inten-

tion to rid a farm of red, brown, and bont ticks, this period must be extended to over a year. From observations made in connection with East Coast fever, where the freeing of an area from the disease is probably due to starving out of the ticks, it can be deducted that a safe period is fourteen months, and we can accept that this period will free any farm from tick life *under the conditions of no host having access to it.* If it is only the intention of freeing a farm of ticks to a certain extent, that is to say, reducing the number of them and not eradicating them completely, the precautions need not necessarily be so strict.

Stock brought on to the tick-free piece of ground will naturally bring with them the ticks again, and they will increase in the usual manner, and after a few months they will be present in great numbers. But if it is our intention to get completely rid of the ticks, precautions must be taken not to bring ticks with the cattle into the clean veld. This can be done by dipping or spraying the animals and immediately removing them on to the clean farm, but it can also be done without dipping and spraying. For this purpose the cattle should be placed on a smaller piece of tick-free ground, sufficiently large to carry them for about four weeks, and should be kept there for this period.

We will call this the quarantine paddock. During this time all blue ticks will have dropped off, and if it is only intended to escape these, the removal of the clean beasts into the final clean area can be done. It is possible that within the four weeks, the group of the brown ticks, engorged larvæ, and nymphæ, which dropped off during the first days of the removal into the quarantine paddock, may develop to a succeeding stage (nymphæ or adult), in which they seek a new host, and then might be carried by the stock into the clean veld. It would therefore be advisable to transfer the quarantine after about three weeks to an adjoining clean piece, where the cattle would have to be kept another two or three weeks; there the remainder of the blue ticks would drop off, and no other new ticks could get on, and after this period the stock could safely be moved to a clean area. It is also possible that by the same procedure the bont tick would be got rid of, so that, theoretically speaking, it is within the range of possibility—without the use of dips or sprays—to get rid of all ticks. In practice this would have to be carried out by splitting the farms up into fenced paddocks, on which, after the stated period of about fourteen months, the movement of cattle could be commenced.

Eradication of Disease.—It is safe to conclude that the eradication of ticks means the eradication of disease. How this can be done has just been demonstrated. Under the conditions where the disease has broken out and no tick-free area is available, it cannot be made use of, and dipping, for the reasons given, would also fail. Here another method can be applied, namely, that of moving the stock out of the infected area into the non-infected one, arranging the movement so that the ticks which carry the infection and the animals which are infected remain behind. But this method can only be applied in those diseases where the immune animals do not act as a reservoir, such as in East Coast fever and heartwater.

East Coast Fever.—The principal carrier of this disease is the group of the brown tick, and occasionally the red tick, but from our point of view they have to be considered as equally harmful. Wherever possibility exists of the spread of East Coast fever, the following precautions should be taken: The cattle should be grazed on one particular

piece of the farm, and not indiscriminately all over; the piece should be fenced off, and under no conditions should cattle be kept there. Should East Coast fever now break out, the following procedure should be adhered to. Collect all the cattle and bring them on one particular place of the clean ground which has sufficient grass to feed these animals for about three weeks to twenty-four days. In this camp the careful selection of sick and healthy animals takes place. The sick animals are killed or sent back to the infected ground, and the healthy animals remain.

In order to detect the sick animals early enough, recourse should be taken to the thermometer, and all animals with a high temperature should be considered infected and turned out of the camp. After twenty-two to twenty-three days, the remaining healthy animals can now be moved into the clean area; they leave ticks and infection behind. The reason for this latter movement will find its explanation in the following facts. The average incubation period of East Coast fever is thirteen days, the longest (quite exceptional) twenty days. The average duration of the disease is twelve days, the longest twenty days (quite exceptional). Within twenty-two to twenty-three days it must therefore be possible, by means of the thermometer, to detect all infected animals. We have stated that the brown tick communicates the disease in either the nymphæ or adult stage. For moulting it requires at least sixteen days, but an average period of twenty-four days. We have to reckon with the sixteen days, and we know that usually after the moulting another eight days elapse before such ticks are able to reach the top of the grass and to bite; of this fact advantage must be taken to remove the cattle out of the area before these ticks are ready to bite, and that is about twenty-three days after moulting. The period of moulting in the red tick nymphæ is about twenty-four days, and here no danger would be expected. But even without thermometers, the moving of cattle is possible, namely, by making use of two quarantine camps, as explained before, leaving the animals in each camp for sixteen days. In thirty-two days all infected animals would have become visibly sick and could be excluded.

Heartwater.—If we want to trek out of a heartwater infected area, for the purpose of saving the stock not yet infected, two ways are open, depending upon what ground is available, and whether such ground is infected with bont ticks. Moving out of the infected area into ground where no bont ticks are present means that the disease must stop.

This has been the experience of many bushveld farmers who, with their stock, went down to the low country, and when troubled with heartwater simply moved back again to higher-lying ground. The fact was known for a long time, but the explanation could not be given since no connection between tick and disease was surmised. If, however, no ground is available free from bont ticks, then the same procedure has to be resorted to as explained in the case of East Coast fever. Moving on to a place which is known to be free of heartwater, remaining there just over the incubation period of the disease, and moving out of it before the ticks which dropped have moulted, and are capable of attaching themselves, for which two quarantines of three to four weeks each will be sufficient.

Eradication of Diseases in which the Animal acts as the Reservoir of the Virus.—This applies to ordinary redwater, biliary fever in horses, and to the three forms of gall-sickness mentioned before. Should any of these diseases break out amongst a lot of cattle and we want to try and save the majority of them by removing them out of the tick-infected area, we can only stop the disease if we move into a tick-free area, leaving all ticks behind. Then the disease must stop. This is hardly possible under present conditions, and when we move the animals out of a tick-infected area into an area free of the disease but tick-infected, we only postpone the appearance of the disease, but will not completely escape it. As soon as the sick and the immune animals reach the new area they will infect the ticks on that area, and after the period of hatching or moulting, as indicated above, the disease will continue. The question arises whether it will be possible to breed stock free of biliary fever as regards horses, of redwater and gall-sickness as regards cattle; we must emphatically say that it is possible if we start with a farm where, by previous starvation, as indicated above, all ticks have been killed, and where all hosts of such ticks are kept out by fencing. Farming with imported horses and cattle which have never suffered from biliary fever, redwater, or gall-sickness must be possible, provided that the farm is kept free of ticks, or even with the presence of ticks, provided that no such animals are on the farm which can act as a reservoir of the virus (immune horses and cattle). In other words, ticks may be allowed on such a farm if they have no chance of becoming infected. Naturally, such animals should never leave the place. They would contract the disease as soon as they were put into the veld where breeding of stock is not carried out under the same conditions. Breeding of stock free of infection from already infected stock can only be carried out under the conditions of absolutely excluding all tick life. It would have to be started by moving the stock through quarantine camps into an area previously cleaned of ticks, but in this case the ticks would, by all means, have to be kept out as long as the original lot of animals (the reservoirs) were present, because ticks introduced by any other kind of hosts would become infected with the disease of the immune animals, and in turn would communicate the disease to their progeny.

Thus, theoretically speaking, it would be possible to clean an area of ticks and to breed stock free of diseases out of imported and immune stock. The question now arises, would this be of any advantage at the present time? If one farmer carries out all the precautions and renders his farm absolutely free of ticks, and thus breeds animals free of disease, it would mean that such animals have no immunity against the diseases mentioned, and would contract them as soon as they were removed into an infected area. It is therefore not advisable at present to carry the tick destruction to such an extent that none would be left on a farm.

The notes given above will be useful in themselves to indicate to farmers how they can reduce the number of ticks. There is no risk of losing the immunity in animals if care is taken that a certain number of ticks always remain present on the farm. Theoretically speaking, from the possibilities as explained above, united action throughout South Africa would enable the country to be freed from such diseases as are carried by ticks. Perhaps a future generation will see the

advantage of doing so, but under present conditions it is necessary to reserve at least a small number of ticks. The Americans, however, have made up their minds to eradicate Texas fever by destroying the ticks, and their success will perhaps serve as a stimulus for South Africa to do likewise.

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No. I.
Report of Research Work, 1908-9.

By Capt. HOLMES.
Muktesar.

In addition to the ordinary routine work of the laboratory, some very useful research work has been carried out at the Imperial Bacteriological Laboratory. From the report which has now been issued with the above title we abstract the following particulars:—

Horse Surra.—During the year an outbreak of this disease was investigated, and systematic research conducted as to the efficacy of various suggested lines of treatment. The drugs used included atoxyl alone, atoxyl and mercury, tartar emetic and mercury, methylene blue and mercury, methylene blue and atoxyl, iodoform alone, and mercury alone. In all cases the drugs were injected directly into the veins, and the treatment was continued for about two months. In every instance under the early treatment the animal improved in condition and the trypanosomes disappeared from the blood, but invariably either towards the latter period of treatment or some weeks after the injections had been discontinued the parasites reappeared, and the disease gained the ascendancy. The use of mercury intravenously seemed to have no beneficial effect. When used alone, it lowered the condition of the animal, and hastened a fatal issue. When tried in combination with other drugs such as atoxyl, tartar emetic and methylene blue, it evidently counteracted to an extent the beneficial effect of these drugs. Better results, however, were obtained by the use of atoxyl and orpiment, the former given by injection, and the latter in ball, as recommended by Laveran and Thiroux. In nine cases where the disease was in an early stage the treatment apparently effected a cure. Whether an equally good result can be obtained with animals in a later stage of the disease is yet to be proved. The best results of all, however, followed the combined use of atoxyl, orpiment and sodium arsenate, the animals showing no ill-effects from the treatment, and rapidly improving in condition.

Blackleg or Charbon Symptomatique.—This disease of young cattle is apparently as prevalent in India as it is in Great Britain, and vaccination has been widely practised for it, but has lately met with some disapproval on account of deaths occurring after the use of the vaccine. The average mortality after the vaccination has been less than 1 per cent., but the mortality has not been evenly distributed. It appears almost impossible to satisfactorily explain this fact, but it may depend on several conditions: the virulence of the vaccine may vary, the animals may have been weakly or diseased, or overdriven, or they may have had special predisposition. The difficulties that have to be contended with in introducing any new line of preventive inoculation in India are obviously increased when it is known that to the Hindoos

the life of the cow, as a rule, ranks almost higher than that of a human being. Consequently any measures of treatment adopted for their benefit must, above all considerations, be free from any risk of accidents. There is little doubt that the use of two vaccines, that is the so-called double vaccine, is the safest method, but it is certainly unpopular, because of the necessity for two operations. Holmes tested the ordinary single vaccines, including Blacklegoids, but his best results were obtained from a mixture of a first and second vaccine. This mixture protected in every case against an undoubtedly much more severe trial than natural infection. One very important and interesting fact emphasized is that the immunity acquired by treatment with vaccines does not set in before at least eight days, and that during that interval the inoculated animals are in a state of hyper-susceptibility. Holmes also expresses the opinion that the pilule form for administration is safer than others.

Hæmorrhagic Septicæmia of Bovines.—This is a widespread and very fatal disease of bovines in India, affecting buffaloes as well as cattle. It is also said to fatally affect elephants in Burma. Two of the many local names by which it is known are "Galghotu" and "Gardu." Buffaloes are said to be more susceptible than cattle, and although nothing is said in the report about horses and donkeys being affected naturally, they have been shown to be very susceptible experimentally. During recent years heavy losses have been recorded, and consequently the veterinary department have devoted much time and energy to the discovery of some means of combating it, principally with preventive serum. The causal organism has been cultivated in broth, and the toxins produced have been obtained and experimented with. Small doses, when inoculated into the veins, proved rapidly fatal, but even larger doses injected under the skin caused no disturbance, and conferred immunity, lasting for some weeks. This short duration of immunity would only be serviceable to protect animals of a herd during a single outbreak, so further experiments were carried out to try and discover some means of conferring longer immunity. Several different sera were prepared and tested in various ways, and eventually a method was discovered which promises to be of immense service. It consists of injecting a serum obtained from hyper-immunized animals, and following in two days with an injection of strong virus, which would be sufficient to kill if not preceded by the serum. The nett result of these investigations up to the present is this: that animals can be rendered immune by two subcutaneous injections, with an interval of two days; and the immunity produced is of long duration. The process causes no rise of temperature or other symptoms. The serum, however, has no curative effect, hence the absolute necessity for prevention. It is hoped and expected that in the field the same good results will be obtained, because the amount of infective material by which the immunity was tested in the experiments must have been many times greater than an animal would be naturally exposed to.

Rinderpest.—The memoir also contains an interesting and instructive account of the work done concerning rinderpest. Holmes has found that for preventive purposes a single injection of serum is sufficient, provided two conditions are observed: first the dose must be protective, and secondly, the animal must be exposed to infection before that protective effect has worn off, that is to say, before ten days.

Reviews.

Cows, Cow-houses, and Milk. By G. Mayall, M.R.C.V.S. Crown 8vo., pp. xii. + 102. Illustrations 24, including 6 plates. Cloth cover. London: Published by Messrs. Baillière, Tindall and Cox. Price 2s. 6d. net.

The author has written this little book with the object of spreading knowledge as to the importance of cleanliness in the production of milk. It is intended for "the man in the street" as well as for the small farmer, who cannot afford to take a course at an agricultural college. Judged from that standpoint, he has produced a very handy, readable, and instructive little book. It deals with the general management of cows; with cow-houses, suggesting points to be borne well in mind in building fresh ones, and points in which the old cow-house may be brought more up to date and better fitted for the production of such an important article of diet as milk. There are many minor points in which we disagree with the author, and perhaps the most important one is as to the use of undecorticated cotton cake, which he appears to recommend. Personally, we feel very strongly against the use of it, and consider that decorticated cotton cake is immeasurably to be preferred, even though it costs much more. In our experience, it pays far better to give a less quantity of the better material, for disastrous results are by no means rare following the use of the undecorticated cotton cake.

The plates illustrating various breeds are very good and excellently reproduced, and the fittings (illustrated), as supplied by the St. Pancras Ironworks Co., Ltd., we know from experience to be thoroughly reliable.

Pocket Book of Veterinary Practice. By A. von Rosenberg, D.V.S. 126 pages. Cloth cover. Price 75 cents, postage 4 cents. Published by Messrs. Boericke and Tafel, 1011, Arch Street, Philadelphia, Pa.

The author of this booklet is an advocate of infinitesimal dosage in the treatment of diseases of animals, with frequent repetition. We agree that there has been a tendency to give enormous doses of drusg immediately animals are ill, especially to horses and cows, but he suggests the other extreme. Of the two extremes, that which he advocates is probably the less objectionable.

The first chapter consists of a "Code of Common Suggestive Diagnostic Symptoms." We will quote a few and let our readers judge of their value for themselves: Cheeks swollen—calculus in parotid duct; delirium—anthrax; forelegs flexed and resting on toe—rheumatism; mouth dry and hot—enteritis; mouth hot and clammy, erysipelas; pulse rapid but weak—anthrax; shaking—anthrax, gastritis.

The major portion of the booklet deals with various diseases and their treatment. This portion may be more useful, but the paragraph dealing with actinomycosis runs: "Treat surgically, with antiseptic precautions. Give internally aconite, alternated with nux vom., hepar sulph., arnica, echinacea." There is no mention of potassium iodide. The binding is worthy of a better effort.

Translations.

TRICHORRHEXIS NODOSA.

By Professors POÉNARO and UDRISKY.

Trichorrhexis is an affection of the hair which attacks all animals possessing long and rigid hair like that of the mane, tail, head, beard, and moustache. The illness is characterized by the development of ash-grey spots on the surface of the stem of the hair, of nodular aspect, and at the level of which the hair breaks, leaving on this region of the skin spots having the aspect of trichophytic spots. This affection is hardly noticed and very incompletely described in the annals of veterinary medicine.

In human medicine numerous scientific researches on the subject have been made during the last few years, not only from the clinical point of view, but also from the etiological standpoint. However, up to now the pathogeny of the malady has not been decided. We are still obliged to read all the theories about the cause written in human medicine. Some believe in trophoneurosis; others in a constitutional malady; Sabaurand in mechanical causes; Hodara in a bacillus; De Keyser, Spiegler, Essen, and Marcusfeld in a pathogenic micrococcus. Trofino says he has observed the malady in two-thirds of the horses in a brigade of artillery, and he identifies it as the human trichorrhexis nodosa described by Kaposi.

Observation.—We have had occasion to examine a horse whose tail-hairs fell out for some months, leaving regions resembling trichophytic plaques. On examining the hair one sees on its surface certain ashy spots, at the level of which it enlarges and forms a node.

However, these thickenings do not represent veritable nodes; but the hair being, as it were, teased out or unravelled at these places, appears larger, like a string whose strands are disintegrated at certain points. The ashy colour is due to disagregation of the cells of the medullary stratum, their disappearance and non-preservation of normal form.

The cells of the epidermis having the form of a scale are partly desquamated; *the cells of the cortical substance*, fusiform and intimately bound together in the normal state, are dissociated and partially deprived of pigmented granulations in trichorrhexia (see fig.) *The cells of the medullary stratum* which in the physiological state are polyhedric and ranged at the centre of the hair like a cylindrical column, are dissociated, decolorized, and in great part gone; cortical cells replace the medullary cells at the level of the false nodes, and by their dissociation give to the hair the aspect of two forceps united, augmenting the volume of the hair at the level of the nodes.

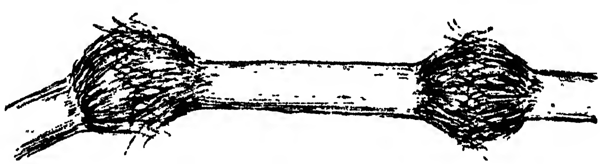
Our microbiological researches have been made after the following method: The hairs affected with trichorrhexis were washed several times in sterilized water; they were afterwards fixed in a culture medium, agar, gelatine, potato, bouillon, &c., employing the aerobic and anaerobic methods. On these culture media numerous colonies of very varied microbes developed; sometimes staphylococci, streptococci, bacilli, at other times a vegetal parasite resembling in a measure *Trichophyton tonsurans.* None of these microbes or parasites would

reproduce the malady, not even when rubbed into the shaved skin of horses or guinea-pigs.

If the cause is mechanical this ought to be confined to the grown hair. Immediately after hair has been shaved it ought to be reproduced normally, but this does not happen; the hair grows just the same, the nodes being reproduced.

To our mind the principal cause *resides in the regenerator (Malpighian) epithelium of the hair, which caps the papilla of the bulb, and which, by proliferation of the cells of this epithelium, makes the hair grow.* The vessels of the papillæ are anæmic, the cells of the medullary stratum are abnormally keratinized, deprived of pigmentary granulations, and neither preserve their situation nor normal form. The cells of the cortical layer, equally under the influence of insufficient and abnormal nutrition, do not preserve their normal cohesion, not only between themselves, but with regard to the medullary stratum.

There exists, then, a failure of adhesion between the layers, which later facilitates dissociation of the cells of all the layers of the hair; dissociation which makes the hair larger in these regions at the same time as it takes on the ashy colour.



[Block for this article kindly lent by the publishers of "Walsh's Diseases of the Hair." It shows precisely the same condition as the original illustration which it was unfortunately not possible to reproduce.—Ed. *V. J.*]

(*Arhiva Veterinaria.*)

BENZENE POISONING IN A DOG.

By Chief Veterinary Surgeon Guhrauer.

In No. 4 of the *Zeitschrift für Veterinärkunde* for January 28, 1909, on page 72, attention is called to benzene poisoning in men. I had the opportunity of noticing such a mishap in the dog which may be of general interest.

A fox-terrier dog, aged 10, always had a very rough and dirty coat which washing with soap and water never improved. Benzene was resorted to in order to remove the spots, and the animal was soaked with it. The result was that the coat remained smutty, but the dog could not stand and looked like expiring.

On my arrival I found the dog lying unconscious in his abode with his feet stretched out; breathing accelerated and irregular, heart beats weak, pulse scarcely perceptible at the femoral artery. From these symptoms I did not give a hopeful prognosis. Black coffee with cognac was given, and afterwards a camphor oil injection. The dog showed improvement after two hours. The great listlessness had passed away, and the limbs were moved. After a further two

hours and another teaspoonful of coffee and brandy the dog was able to stand up. On the following day he seemed completely recovered

Here, just as in poisoning in men by benzene, there was severe unconsciousness and heart weakness, which, however, passed away in a short time.

(*Zeitschrift für Veterinärkunde*).

CONCUSSION (SHOCK) NEUROSIS IN THE HORSE AND DOG.

By Dr. H. JAKOB,
Munich.

With the rapid additions to modern means of transit in great cities the number of the above-mentioned accidents to man and beast has increased. In very many cases one sees no wound but a severe shock to the whole body, which in certain circumstances may be recognized as a nervous affection for some days. Jakob designates this concussion neurosis, corresponding to the traumatic neurosis of human medicine. He had the opportunity of seeing two horses that had been in contact with an electric tram and five dogs that had been in collision with automobiles. The horses were very much excited, and could with difficulty be kept going; in the stable the excitability declined. The look remained fixed for a long time; the hair was often wet with sweat. The animals would not lie down in the stable at first, but later they reclined with the greatest caution and anxiety, but at the slightest noise the whole body quivered. Thus the flow of water from a hose-pipe caused violent tremors of the muscles. Urine and dung were irregularly voided, and the heart's activity declined. Both horses recovered after two months, but they were not so quiet and docile as formerly.

The dogs were ill in a similar way; they were timid and frightened, shy looks, and inactive. When called they came along with arched backs; they yelped and showed severe trembling, lasting several minutes. Snapping and biting, they would withdraw to their retreats. When free in a busy street the restlessness increased; on the approach of a motor they fled. After several weeks they got better, but their earlier liveliness and adroitness were impaired.

(*Berliner Tierärztliche Wochenschrift.*)

ORCHITIS IN THREE BULLS CAUSED BY THE MICROBE OF INFECTIOUS VAGINITIS.

By RAEBIGER.

A bull, aged 2, had been used to serve three cows. Four days after the first service the right testicle increased in size, and reached the dimensions of a child's head in ten days. Appetite was suspended; rectal temperature, 41·4° C.; pulse, 140; testicular cord tumefied, and the region very painful.

The organ was suspended in damp wadding, and 20 grm. of antifebrin given daily, and subcutaneous injections of iodide of sodium.

The general and local state of the animal improved, and he was sent to the butcher.

A month had hardly elapsed before another case of orchitis occurred in the same stable and presented the same signs. Thirty-eight cows and ten heifers were examined and found to be affected with contagious vaginitis. Raebiger advised the owner to cut the hairs off the sheath and wash the cavity with a solution of lysol immediately after the service. The attendant neglected these precautions, and another bull was attacked. The animal was cured, and again used after disinfection of the sheath and penis.

(*Revue Générale de Médecine Vétérinaire.*)

THE TREATMENT OF MAMMITIS IN THE COW.

By M. L. BIGOTEAU,

Veterinary Surgeon of Ouzouer-le-Marché.

In a note published in this Journal (*Revue Générale de Médecine Vétérinaire*) in 1905, I made known the results of systematic treatment of mammitis of the cow by injections of boricated water. One injects into the sinus of each affected quarter 120 to 180 grm. of a 3 per cent. boric acid solution. The solution is made with boiling water. The liquid is injected as it is in summer; in winter it is kept at a temperature of 20° to 25° C. At the same time a purgative is given internally (mixture of sulphate of soda and Barbadoes aloes). The inflamed quarters are milked out every three or four hours until cured. The boricated injection is not renewed except in rare cases, when the milk continues to be altered. In these instances a second injection is made after three or four days.

The method has since been employed in France and foreign countries, in general with the same success. For successful treatment it ought to be practised early. Another condition is also *necessary*, and neglect of it has doubtless caused failure in not a few cases. For favourable boricated injection *the inflamed quarter must be completely emptied before receiving the injection.*

The usual milker, even though expert, is generally incapable of completely emptying the contents of the reservoirs. I have hundreds of times observed that when the milker declares that the gland is empty, and that nothing more can be drawn, that a clot filling the collecting sinus can be extracted. This previous operation constitutes the *tour de main* which decides the success of intervention. One knows that the reservoir is situated inside at the origin of the teat, levelled out under the skin. One of the first effects of infection consists in coagulation of the collected milk. It is this clot that must be extracted. It is done by patient work of dissociation; it is accomplished by [repeated pressure from above to below with the thumb and one or two fingers, so as to break up and detach the coagulated mass. This being done, one catches hold of the base of the teat with the hand—which the milker never does—and one operates by graduated regular pressure until the extremity is free. Renewing this procedure needed to dissociate the clot, one finishes by extracting the contents of the sinus. Sometimes a pasty mass is obtained about

the size of a nut. One knows that the operation has succeeded when the cutaneous region corresponding to the sinus, previously stretched, declines and gives the soft feel of a slightly œdematous tissue. The forgetting of this simple precaution leads to the majority of unsuccessful treatments, for I believe that every mammitis of the cow is amenable to boricated medication in the conditions indicated.

(*Revue Générale de Médecine Vétérinaire.*)

OTITIS EXTERNA IN THE HORSE.

By District Veterinary-Surgeon Dr. OPPERMANN

Wanzleben.

Whilst otitis externa is not at all uncommon in the dog and is frequently recorded in literature, the same cannot be said of the horse. On this account five cases noticed by me during last summer and autumn seem worth describing. I was asked by the owner of a hackney to bleed him, as the patient showed signs of plethora. I gathered that as soon as the horse warmed to his work that he shook his head violently, tossed it up and down, would not answer to the reins, had an unruly or one-sided gait, as "if he was stupid."

I noticed that the bridle fitted all right in all the horses. I could not discover any injuries or tumours on the ear muscles; but the internal wall contained a thick sticky layer of dirt. Rubbing and slight massage of the root of the ear gave the animal visible ease. There was no smacking of the lips, as is often the case with the dog.

After diagnosis of otitis externa I had the external ear thoroughly and cautiously cleansed with luke-warm water, afterwards rinsed out with pure warm water, and swabbed out and irrigated with about a 3 per cent. spirituous solution of resorcin.

In four cases the bad symptoms disappeared in from eight to fourteen days. In one horse that had suffered for several months, and had in consequence become very thin, the shaking of the head did not cease after the above treatment, but it improved. In this case daily instillation of anæsthesia (Kitsert) 3 parts, and rectified spirit and distilled water, of each 50 parts (a teaspoonful daily poured in), soon effected a cure.

All the above cases occurred in fine bred horses, and I conjecture that in these the internal surface of the ear muscle does not produce such long and thick hair as that of heavy and ill-bred horses. The thicker and longer the hair the better and more completely penetrating dust is caught and excluded from the ear cavity. The latter mixed with the secretions from the glands of the ear forms thick oily masses, which easily set up irritation of the external ear.

(*Deutsche Tierärztliche Wochenschrift.*)

Correspondence.

To the Editors of the VETERINARY JOURNAL.

SIRS,—I have read a note taken from the *Recueil de Médecine Vétérinaire* of September, 1909, concerning the veterinary profession of the United States.

There it is stated that, in the United States of America, only those veterinary surgeons will be employed who have qualified in the English-speaking schools, with the one exception of those who have earned their diploma in the Veterinary School of Lemburg. The first stipulation is reasonable, but the cause of the second statement cannot be understood.

I know very little of the Lemburg School, and I do not feel in a position to adequately defend the rest of the European schools. I know at least, however, that other schools, and especially our school at Budapest, rank as high as the School of Lemburg. Perhaps there was no Hungarian veterinary surgeon in the service of the United States, but if there were I am sure he would do very good service.

Let us hope that they will pay more attention to the brother schools of Europe in the future.

Yours faithfully,
A. LÁSZLÓ,
Veterinary Surgeon.

Fuzesgyarmat,
Bekes M., Hungary,
January 8, 1910.

[Unfortunately we have not seen the note referred to by Mr. László and we do not know what it is that the English-speaking and the Lemburg men are to be employed for. Does it refer to the public services or to private practice? We do not know of the law or regulation dealing with this matter, and perhaps one of our American readers will enlighten us. However, we agree with our correspondent that graduates of Budapest and other European colleges are quite as competent as those of Lemburg.—EDS., *V.J.*]

Books and Periodicals, &c., Received.

Bulletin of the Sleeping Sickness Bureau; Rhodesia Agricultural Journal; The History of the Dunmow Flitch; Bulletins of the Bureau of Animal Industry; Board of Agriculture and Fisheries Department of Agriculture and Technical Instruction for Ireland; The Age (Melbourne).

Letters and Communications, &c.

The Merieux Institute; G. Mayall; D. Dey; A. László; A. Wilson; T. Runciman.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

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Illustrations for reproduction should be in good black or dark brown on white paper or card.

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HERR SCHMIDT OF KOLDING, DENMARK

THE

VETERINARY JOURNAL

MARCH, 1910.

HERR SCHMIDT, OF KOLDING.

NO country practitioner of any nationality is better known in in the veterinary or agricultural world than Herr Schmidt, of Kolding, in Denmark. Had he chosen to be of a selfish turn of mind, and to have kept his discovery to himself, he might have made an enormous fortune for his researches into the treatment of milk fever, and the generous publication of his results have been the means of saving hundreds of thousands of pounds worth of cattle, and of converting what used to be a tedious and thankless task for the country practitioner into one which he now undertakes with a light heart.

Born near Haderslev on July 15, 1845, he took his veterinary diploma at Copenhagen in 1872, starting in practice at Smidstruys, and eventually settling down at Kolding. There he soon gained the confidence of the farmers, and by his carefully recorded observations speedily made a name amongst his veterinary colleagues as a skilful and observant practitioner.

As a result of his researches into tuberculosis, he published a scheme in 1886 which he had worked for several years with success, and which had acted very satisfactorily in checking this disease in his district. He was the pioneer of the idea that farmers should have their cattle examined at least once a year regularly by a veterinary surgeon, and have the suspected animals isolated and disposed of by fattening or otherwise, so that the loss might be minimized as far as possible.

One of his suggestions, too, was that the milk of suspected cows should not be used for feeding purposes until it had previously been boiled. These ideas were carried out with excellent success as regards the result on the stock in his district, and a few years later were elaborated into the more stringent investigations and application of the tuberculin test by Professor Bang, whose scheme for stamping out tuberculosis in the cattle of Denmark has met with such splendid results. Herr Schmidt's researches into the study of milk fever in cows were first published in 1897, and it needs no words on our part to say how far-reaching and valuable those results have been. In every civilized country of the world Schmidt's treatment is carried out, and the number of lives which have been saved by the treatment alone can be counted in hundreds of thousands. As was stated by Professor Degive at the International Veterinary Congress at Buda Pesth in 1905: "Par sa methode thérapeutique notre confrère Schmidt a rendu à l'Agriculture et á la fortune publiquè des services incalculables. Du même coup il a élevé la valeur et le prestige de la Médecine Vetérinaire."

Herr Schmidt has been decorated by the King of Denmark as a Knight of Danebroge, and has been awarded a vote of thanks, together with an annual premium, by the Danish Parliament; also in many countries of the world (including Great Britain) he has been honoured with the degree of Membership of many Veterinary and Agricultural Societies.

He still takes the greatest interest in all matters pertaining to his profession, and was present at the last International Veterinary Congress at the Hague. His colleagues in England trust that it may be their good fortune to have the opportunity of welcoming him in London in four years' time, when the next Congress holds its Session in this City.

The excellent photograph of the late Mr. A. Wheatley, which we reproduced in our last issue, was by Mons. Sala Arbus and Sons, Reading.

Editorials.

STERILITY IN CATTLE.

We need offer no apology for giving an excellent article on the above subject this month by Mr. Albrechtsen, a Danish veterinary surgeon, although the subject was very thoroughly and ably dealt with by Professor Hess in his paper, which we reproduced last month. The subject-matter is of the highest importance to breeders in this country, and yet it has had very scant attention in the shape of systematic investigation. These two observers have shown quite clearly that sterility is very frequently due to some curable disease of the genital passages, sometimes contagious and sometimes non-contagious. Professor Hess considers that in Switzerland the commonest cause of the condition is infectious granular vaginitis, a disease certainly present in this country, but which would appear not to have been recognized until lately. Mr. Albrechtsen says that in Denmark a chronic catarrhal inflammation of the uterus is the main cause of the trouble, and he quotes in proof the successes obtained by rational treatment of that affection.

Now both these conditions exist here as well as on the Continent of Europe and elsewhere, and yet we know of no systematic endeavour to diagnose and treat them on farms where sterility is almost causing the ruin of the farmer. Obviously antiseptic irrigation of the affected organs is the line of treatment to be adopted, but care must be taken that in the case of the uterus the irrigating fluid must certainly be injected into the womb through the os uteri, or this treatment will be useless.

The subject of sterility is very intimately associated with abortion, and it would confer a great boon upon the agricultural community if the commission, now investigating abortion, were to be instructed to extend their researches to include sterility in cattle. However, veterinary practitioners carefully reading the articles by Professor Hess and Mr. Albrechtsen will be in a much better position than before to advise their clients on this most important question.

THE TREATMENT OF WOUNDS.

A YEAR ago in the VETERINARY JOURNAL we reproduced a most instructive article on the above subject by Sir W. Watson Cheyne, in which he argued strongly in favour of the *antiseptic* treatment of wounds as opposed to the more recently introduced method of *aseptic* treatment. We were especially pleased with it, owing to the fact that it is possible to undertake his line of treatment, rational Listerism, in veterinary practice with hope of success, whereas this so-called aseptic method is obviously impracticable owing to the conditions under which our operations have to be performed, and the great difficulty in procuring protection against possible infection of wounds after operation. The excellent results that are obtained in veterinary surgery when attention is paid to detail in antiseptic treatment, in spite of the great difficulty of subsequent control (our patients cannot be persuaded to lie for days between clean sheets), speak for themselves. It is little to be wondered at that we cannot claim quite the same results as in human surgery, but our proportion of operation wounds healing without stitch abscess formation by first intention is rather remarkable to say the least.

As a set-off against Sir W. W. Cheyne's article, the surgeons at another hospital, where the aseptic method is now in vogue, have collected records of their present results, and contrasted them with the less favourable results they obtained formerly under the antiseptic method. Elsewhere in this issue (p. 154 *et seq*), we reproduce Sir W. W. Cheyne's reply to the argument adduced by those results. He states the case in a most masterly manner, and completely upsets all their conclusions by quoting the results obtained by himself for some years past, which are very considerably better than those claimed for the aseptic method, and he very cogently suggests that if those results are the best that can be claimed for the new method, the sooner it is discarded the better. The article is of special interest, and especially so if read in conjunction with his original article to which we have referred.

NOTIFICATION OF CONTAGIOUS DISEASES OF ANIMALS.

We wish to draw our readers' attention to the Order of the Board of Agriculture and Fisheries on p. 176 instituting payment for notification by a veterinary practitioner of the existence of suspected existence of scheduled diseases of animals amongst his patients. It must be noted that the Order is compulsory, not optional, as the Order states, that "a veterinary practitioner . . . *shall* with all possible speed give notice, &c." A new principle is also introduced with this Order in the form of the payment of a fee of 2s. 6d. for notification of each case or outbreak.

The Order is to come unto force on the first day of next month (April).

THE IMPORTANCE OF CLINICAL OBSERVATION.

The lessons of the laboratory can only be of vital use to the medical or surgical world when they have been proved by the clinician. It is the latter, the man whose life brings him in daily contact with animal suffering, whether of man or the brute creation, who must give the final opinion and make the tests which will decide as to whether the preliminary laboratory work was of real *practical* value or not.

Without the application and observation of the clinician the greater part of laboratory work would be valueless in its effects to benefit the world. The two are indissolubly connected, and neither can take precedence in what is the primary aim of all who embark upon the study of medicine, viz., the fight against disease.

General Articles.

STERILITY OF THE COW AND ITS RELATION TO INFECTIOUS DISEASES OF THE GENITAL ORGANS.

By Herr ALBRECHTSEN.

Veterinary Surgeon, Aakirkeby, Denmark.

To us in Denmark, where butter production brings in the greatest profit, sterility of the cow is of great and far-reaching importance, because through it the homesteads of our country suffer, there is no security in breeding, and milk supply lessens, great loss resulting.

The milk cow, in order to produce as great a profit as possible, must not only have regularly occurring periods of pregnancy, bu parturition must occur in our country in autumn or early winter.

The animals are then fresh milking at a time when we have the most and best food; for only occasionally do we find proprietors whose operations are so directed that they have equally good nourishing material all the year round. If breaks happen in regularly occurring pregnancy, so that the cow is either excluded from propagating her species, absolute sterility or the subsequent calving is delayed for a longer or shorter time; in relative sterility usefulness will decline; the same will also be the case if pregnancy ends before the time—that is if the animal aborts. Relative sterility called, by the name of "Ueberlaufen," as well as abortion, is the most frequent occurring form here in Denmark. As in other countries, so with us, commonly operating causes must be reckoned with, which should especially be sought in the one-sided development to which the milk cow has been for many years subjected, and in the rich and very often artificial nourishment given, which clearly produces a certain disposition to sterility.

As regards the direct influencing factors, preference has been given to cystic degenerations, and in the last year to the *corpus luteum persistens*. As a recent thing also, according to Swiss authority, a vaginitis et metritis follicularis, which in the chronic form has spread very widely, has been charged with and accepted as causing aconception in non-pregnant animals, and abortion in in-calf animals. Further, we know very well that certain uterine affections, especially at the cervix, lead now and then to sterility. It is well known, also, that cows, which after parturition have suffered from metritis septica

[1] Ninth International Veterinary Congress, Hague, 1909.

(occasioning retentio secundarem, wholly or partially, torsio uteri, and so on), frequently become quite sterile, or for a long time keep coming on heat, the last named being caused by chronic metritis or endometritis.

That uterine ailments now and then lead to sterility is a matter of daily experience; all authors who have written thereon have attributed a smaller significance to these diseases than to affections of the ovaries and vagina. One reckons only with the pronounced cases of uterine disease causing great discharge from the external genitalia and large collections in the uterus, whilst the chronically occurring and insignificant cases are wholly overlooked.

Post-mortems, examinations *per rectum*, and drawing out of the cervix through the vagina of the genitalia of many non-pregnant cows which showed abnormal symptoms of heat, have convinced me that in most animals of this kind there is a catarrhal affection of the uterine mucosa, leading generally to sterility, or at best to endometritis.

In the years 1905 and 1906, *post-mortems* on the genital organs of unfruitful cows were undertaken in the bacteriological department of the experimental laboratory, under the direction of Professor Bang and Assistant Tuff. Of ninety-seven organs examined, sixty-four, or 66 per cent., showed pathological changes. The most frequent-occurring disease was an interstitial endometritis, which was established in no fewer than fifty-eight cases. This affection occurred with and without change of the glands, whose number afterwards could be increased or diminished. In the former case the uterus was generally normal in size, the mucosa a little injected and covered with slime, the glands normal, the interstitial connective tissue enlarged, poor in cells, corded, and the vessel wall thickened.

In interstitial endometritis with diminution of the glands, the changes were more obvious, the cornua uteri asymmetric, the mucosa strongly injected covered with blood-tinged mucus, the glands in smaller number destroyed, or united in groups separated by firm connective-tissue bands. The gland-ducts were widened, tortuous, or wounded with serrate edges. Chronic metritis with visible changes in the uterus was only found in four of sixty-four cases. Besides, there were found various changes in the ovaries (cysts and corpus lutea), in the oviducts (salpinx), and now and then para- and peri-metritis, hypertrophia cervicis, different vaginal affections (cysts, cicatricial formation, catarrh, &c.). But all these affections were in small number, and, as it appears generally, of a secondary nature. These *post mortems* showed also the relative frequency of complaints

of the uterus; whilst we must recollect that a mass of these cases, if chronic in their course, are only of a slight nature, and only cause superficial inflammatory processes which completely disappear, without leaving behind changes in the respective tissues. A greater portion shows itself only in redness and swelling of the mucosa, as well as in hypersecretion, sometimes without further change of the nature of the secretion. All these changes can only be properly recognized in the living animal, and are only indifferently or not at all seen *post mortem*. Therefore all these cases up to a certain point during œstrum very often cause sterility.

By careful examination of the genital organs of non-pregnant cows with irregularly occurring œstrum it is possible in most cases to recognize different ailments which have their situation in the uterus, cervix, portio, vagina, ovaries, oviducts, or in the neighbouring parts, now occurring in the one, and now in the other, of the known organs.

By rectal examination one will then find the uterus variedly enlarged, the walls are more or less thick, hard, or firm; sometimes œdematous or knotty. Frequently, also, one finds in the uterus greater or smaller collections. In pyometritis, occurring not seldom, the uterus is always greatly enlarged, stretching far into the abdomen, and fluctuation can always be plainly felt. In the majority of cows with irregular œstrum, one cannot detect any contents in the uterus, but generally a thickening of the organ with noticeable asymmetry of the cornua, which then projects downwards rather deeply into the abdomen; yet the horns can be also short, thick, and, at times, rolled together. On touching the horns, one can trace plain contractions.

In inspectio vaginæ by fixation of the cervix and retracting the same with forceps or hooks, it will be found that in most cases the cervix is the site of considerable affections, causing more or less swelling of the portio vaginalis, and of the mucosa of the cervical canal throughout its whole length. The portio, on account of this, changes considerably in form. The cervical canal deviates much from the normal, not only in length and width, but also in situation and disposition of the external and internal orifice. Often the changes extend into the deeper layers of the tissue, so that the cervix becomes thicker and longer. During periods of œstrum the tendency of the cervix to enlarge is then considerably limited, or completely arrested. The vaginal portion can be more or less swollen and the swelling scarcely noticeable, or as big in circumference as two doubled fists. It is frequently irregular in form; the surface often appears forked, fringed, or much lobed, or its whole length may be swollen in

radiating folds. The surface will, in the latter case, be formed by a number of finger-thick ridges, which radiate or collect in the centrum. In some cases these folds are not very pronounced, are slightly obliterated, and form a kind of trimming round about the mucosa, which is greatly swollen and projecting out of the cervical canal, making an irregularly formed wall surrounding the wide opened orifice of the womb.

In other cases the folds were not very pronounced and almost of normal colour, but within the fringe one could see the mucosa of the cervical canal projecting and presenting a smaller or larger swelling of deep red colour, very sharply defined from the surrounding pale red mucosa; besides, it was damp and slimy in appearance and covered the orificium extern. completely.

Not infrequently one meets with other abnormalities of the vaginal portio such as rents which extend more or less anteriorly, connective-tissue bridges of different thickness, as thick as one's finger, or as broad structures which extend from above to below and cover the orificium extern. completely.

The cervical canal shows great differences in width, in the condition of its mucosa as well as of the orificia extern. et intern. As a rule, one finds the orificium extern. in the middle of the portio; in the frequently occurring changes of form the orifice alters its position, and may be one-sided, up or down.

The cervical canal in the majority of cows with irregular pregnancy is open and so wide that in many cases it can be penetrated with a large Bozeman's catheter.

The mucosa is almost always the situation of inflammation, and is then swollen, strongly injected, and hypersecreting. In the cervical canal one always finds a secretion varying much in amount and consistence. Generally, it is copious and muco-purulent, and may be more of the one or of the other; often it is mixed with flocculi and lumps. Not seldom in nymphomaniacal cows the secretion is plainly limited to the cervix, whereby the mucosa of the canal and portio is covered with a tenacious, smeary secretion of yellowish-white colour. The canal is now and then filled with a thick, very tenacious slime, and this mucus projects from the external orifice like a plug.

By careful examination in the great number of unfruitful cows an affection of the uterus can be established, which in most cases is connected with endometritis catarrhalis and more seldom with metritis.

The causes of this complaint are:—

(1) More or less septic acutely running inflammations of the uterus whose ending is the chronic form.

(2) Benign chronic and slowly advancing processes at the beginning which pass away without injuring the general condition, and without noteworthy discharge from the external parts of the genitals. Anamnesis of unfruitful cows and rectal and vaginal examinations have convinced me that most cases of endometritis date from the last calving. During or immediately after calving one finds an infection in the genitalia; inflammatory processes of different degree and condition then form, predisposing the genitalia more or less to wounds or injuries; also the mass and virulence of the infectious material visibly influence the course of the inflammatory processes.

If we examine the visible septic inflammations of the uterus with copious secretion we shall agree on their frequency and etiology. We know that more or less harmful infections are caused in consequence of difficult parturition, torsio uteri, or retentio secundin. This latter calamity is a most frequent source of infection of the uterus with subsequent sterility.

In this connection we need only notice the relation between infectious abortion and sterility. Most cases of abortion, perhaps with the exception of those in the first months of pregnancy, are caused by the bacillus of abortion discovered by Bang. This bacillus is introduced into the system partly through covering and partly as we know through the food.

In most cases of abortion great inconvenience is caused and the cow is very hard to get pregnant again. Unfortunately with us there are not many yards where abortion does not become stationary. The most evil accompaniment of abortion—the resulting sterility*—is plainly due to secondary uterine infection, and this depends on whether the placenta goes away spontaneously or not; in the latter case the method of treatment introduced is of importance.

Also in normal parturition retention of the after-birth is a frequent sequel which causes much harm, which by systematic examination of the stock on many and large holdings can be proved. But uterine infections may occur in normal calving and regular ejection of the placenta, as may be frequently seen where there is often copious and chronic discharge. As a rule, they are then benign affections without general disturbance. Most of these disappear without being noticed because the discharge after calving is not abnormal either in quantity or consistence, and because it soon ceases. Not infrequently a

pronounced inflammation may be present, co-existent with a great enlargement of the uterus, and often with a palpable collection in this organ. These complaints are generally announced by abnormal expression of heat and aconception.

By examination of the genital organs systematically and early we find a great number of animals very hard to get pregnant, and in which metritis is prevalent. We agree with Kitt that this kind of anomaly in animals which have never borne young is seldom found. Most endometrites are a direct result of an abnormal parturition, as the opportunity for infections of many different kinds is at this time a very favourable one. On farms where parturition of cows is very irregular little or no difficulty occurs with the heifers; but where these have calved or aborted the trouble arrives.

How, then, does chronic endometritis cause sterility? In different individuals there is no doubt an essential difference of sterile-making moments which in most cases may be sought in one or several of the following conditions:—

(1) Stenosis either in the cervix, horns, or oviducts, but most frequently in the first-named. The individual causes of stenosis are either changes of form of the portio vaginal, strictures of the cervical canal, or strictures of both orifices. Further swelling of the mucosa inside the whole uterus together with secretion of increased or changed mucus.

(2) Changes of the uterine mucosa transient or continuous which hinder the implantatio ovi and cause abortion in quite an early stage of pregnancy.

(3) Secondary ovarian affections through encroaching inflammatory processes, or through reflectory ways by which normal ovulation is hindered or destroyed, whilst a cystic degeneration of the Graafian follicles together with a faulty atrophy of the corpus luteum arises.

Concerning stenosis, there is no doubt whatever that this causes sterility in the cow. The uterus of the cow and the narrow ring of the cervix are so formed that no great changes are necessary in order to render a segment of it impassable. So the covering act of the bull is quickly performed; the spermatic fluid is proportionately small, since it is necessary that the sperm be deposited in a definite place—namely, in the external orifice of the womb.

The changes which one encounters so frequently in the cervix of unfruitful cows cause, as a rule, such great deviations from the normal condition that the passage of spermatozoa through the cervical canal is difficult or quite impossible. That a uterine mucosa covered with

slime, pus, or membranes whose glandular apparatus is wholly or partially destroyed, is not in a position to bring about internal union with the ovum is quite self-evident. The natural result, then, is early abortion.

Cystic degeneration of the ovaries I consider to be a secondary complaint, caused and maintained by uterine affections. The proof of this, I hold, is established by these facts:—

(1) Endometritis is found existing at the same time as the cyst.

(2) The endometritis is primary, and the cyst secondary.

(3) The cystic formation disappears or ceases as soon as one treats the endometritis. In regular examination of new milking cows about a month after calving I have always found, accompanying the cyst in the ovaries, a quite pronounced enlargement of the uterus, often also a small collection of fluid in the same; in all cases of cystic ovaries I found the cervix the seat of an inflammation accompanied by not inconsiderable secretion.

Since the occurrence of cysts in the greater number of nymphomaniacal cows can be traced back to a month after the lost calving, anamnesis, and especially rectal examination, shows clearly that the uterine disease is primary and the cyst secondary. So it happens that cyst formation ceases with a regularly carried out treatment of the uterus, and bellowing, nymphomanic cows are almost extinct from those standings which went in for proper treatment.

Even old cases of nymphomania have been completely cured, as the following shows that in 1906-07, of twenty-three regularly-treated holdings, with about 2,000 cows, ten bellowers were not cured; and in 1997-08, of fifty-three properly treated homesteads, with about 3,100 cows, nine bellowers remained uncured. Of old cases of nymphomania I have treated in the last two years 141 head, of which 117 have been cured.

I neglect the corpus luteum persistentiæ, and undertake no squeezing of it out, as it is quite superfluous. After treatment of the uterus œstrum occurs regularly in the course of the first three weeks.

Infectious forms of vaginitis play a proportionately small *rôle* as causes of sterility in the cow; acute vaginitis, with severe symptoms, is rather easy to cure, and seldom causes sterility. Chronic vaginitis follicularis is a very harmless affection, which bears no casual relation to co-existent sterility.

Treatment must be quick and comprehensive. Doubtfully pregnant cows must undergo rectal examination, and pregnant animals be separated from non-pregnant. The latter are then treated according

as they suffer. Treatment is dependent on a fresh and early diagnosis of pregnancy.

How early can one, then, diagnose pregnancy? Pregnancy can, in most cases, be certainly diagnosed when the fœtus is six weeks old, in some cases earlier, and in others later. The signs of pregnancy are as follows: An asymmetrical bulging out of the uterus, whereby the pregnant horn becomes a little larger than its fellow. The walls become soft and quite thin, and plain fluctuation occurs at a definite place. The cervical canal is generally firmly closed. The non-pregnant animals are put under suitable treatment, according to the situation and nature of the complaint.

Since chronic endometritis, as well as real metritis, arises from uterine infection occurring immediately after calving, so uterine affections in the cow demand careful treatment at this period.

It must be our aim to hinder infections if possible, and, if such have occurred, to bring the subsequent inflammation of the uterus to a conclusion as quickly as possible.

It is an undoubted fact that retention of the after-birth is one of the most frequent causes of infection. A rational treatment of this evil is therefore of great importance. As is known, very divergent opinions prevail as to which is the best method of treatment in these cases. I have taken away thousands of envelopes, and I am now completely convinced that only by right-timed (opportune) taking away of the secundinæ can normal conditions be most certainly and expeditiously restored.

If infection by extension or other causes has occurred in the uterus, with resulting inflammation, this must be energetically combated, which is best accomplished by removal of the collected secretion and purifying and disinfecting injections. To accomplish this work satisfactorily has hitherto been very difficult, since only with great trouble, or not at all, was the practitioner in a position to introduce instruments through the bowed, narrow, and beset-with-folds cervical canal. This difficulty chiefly arose through the unsuitability of the instruments and the unrest of the animal. The treatment was very faulty on that account, probably resolving itself into irrigations of meaningless strong solutions of sublimate, carbolic acid, creolin, or lysol; whilst an effective distension of the uterus was either quite unobtainable or only faultily performed. But even very strong solutions cannot effect removal of the uterine secretion, and, indeed, through stagnation they may become injurious.

The chief weight must be put on complete emptying of the uterine

secretion. The latter is best accomplished as follows: I place in position a vaginal dilator of my own design, and by means of a double-hooked retractor inserted into the interior of the canal of the cervix uteri I draw the latter as far back into the vagina as possible. To get a firmer hold I apply a pair of Museux's forceps to the cervix. I may remark that the animals submit to the operation I have described without showing any evidence of pain, and only resist slightly when the hand is introduced into the vagina; the animal being held during the operation by two or three men. It is then possible to introduce a wide, flexible india-rubber tube furnished with sharp edges. By means of different catheters, and with the help of a mandarin, it is then possible to easily remove a secretion from the uterus, however much it be hardened or organized. Lugol's solution has given me the best results in chronic endometritis. If the portio is greatly deformed I remove the diseased tissue with knife and scissors. If the mucosa of the cervical canal is swollen and very much inflamed, it is cleansed with tampons soaked in spirit, and afterwards pencilled. With my method I have cured 90 per cent. of sterile cows, and restored normal conditions in herds where 60 per cent. were diseased.—G. M.

GASTRO-ENTERITIS IN CATTLE; MALIGNANT CATARRHAL FEVER.[1]

By Dr. A. Theiler, C.M.G.

Government Veterinary Bacteriologist for the Transvaal.

Under the first name in British East Africa, and under the second in German East Africa, a disease is described of which I must confess that, although the names suggested nothing new in any way, yet quite a new disease is meant, which was not before known in literature. We may define it shortly as a contagious disease, resembling somewhat rinderpest. Since its contagion is beyond doubt, and it has in British East Africa already been spreading over a considerable area, it may become more than simply interesting for a South African veterinary surgeon.

In German East Africa the disease was first noted in Mpapua in 1906, in a herd originating from Ugogo; the following year it was seen in Kilimatinde, in Moschu, in Usambara, in Uhebe, and Tabora. Natives did not know the disease, a sure sign that it must have been

[1] *Transvaal Agricultural Journal.*

of recent introduction in those places. In British East Africa it first came under notice in a mob of cattle which were brought from Kisumu by Somali traders. Since that time it has been found on several places, and was the cause of considerable mortality amongst the young stock in the Northern Masai Reserve. The natives of Kisü and the Wa-Kavirondo did not know the disease, and the Masai mistook it at first for rinderpest. All breeds and all ages, as well as both sexes, are susceptible; the greatest mortality is, however, noticed amongst the young stock and in animals of bad condition, whereas in many herds full-grown animals did not show any signs of illness.

Symptoms.—These may be developed in a more or less pronounced degree; we might distinguish them as general and specific ones of the head, the intestinal tract, and the skin. The disease may have an acute or sub-acute course. General symptoms: The first one is the fever, which, in acute cases, may run as high as 105° F., whilst in subacute cases, where an emaciated condition becomes pronounced, it may be low or even entirely absent. The animal shows distinct illness, staring coat, loss of appetite and rumination, drooping ears; loss of condition sets in, and emaciation may finally follow. Death in acute cases is said to occur within three to five days; the sub-acute form may linger on for about three weeks. Specific symptoms: There is a watery discharge from the eyes and the nose. After a day or two the discharge become mucous, but quite exceptionally muco-purulent. It is this symptom which reminds one of rinderpest at first sight. There may be an increased salivation, saliva dropping from the mouth, sticking around the lips, and giving it a dirty appearance; the animal grinds its teeth, and on opening the mouth an offensive odour may be met. The examination of the mucous membranes of the mouth may show a bran-like deposit on the gums, which can be easily removed, exposing pale pink exfoliations; in a number of cases there is ulceration under the incisor teeth. These are sometimes round and discrete, at other times confluent; ulcers of the buccal and lingual membranes are reported to have been seen. The bowels at first are constipated, the fæces being passed in small hard lumps. In the course of two or three days a thin watery diarrhœa sets in; it is seldom mixed with mucous or blood; it does not excoriate the skin of the hindquarters, and abdominal pains are absent. Although the diarrhœa is persistent, it is not accompanied with straining, the liquid fæces running from the animal without even elevation of the tail. The skin may become the seat of an eczema,

appearing rough and scurfy, the hairs sticking together in small clusters. This may be so pronounced that it can be noted at some distance.

Pathological Anatomy.—The following *post-mortem* report was made on August 4, 1909, at 11 a.m., on a cow, aged about 4½, which had died early in the morning. Condition rather poor, eyes sunk, slight superficial erosions of upper gums, mucous of vagina pale; rigor not complete; skin eruption all over the body, but especially pronounced on the shoulder and neck; blood well coagulated; there was a slight reddening of the papillæ of the first stomach; the membranes of the second and third stomachs were normal; contents soft; fourth stomach contained liquid; mucosa uniformly deep reddened and even black, with the folds swollen. The duodenum was covered with a yellow deposit, having the consistence of cream cheese; it could be easily removed, leaving a superficial erosion of the mucosa, which was reddened and swollen. A similar condition was found all through the jejunum, the deposit being in patches and of distinct croupous character. The ileum was diffusely congested; black zebra markings were present. The yellow croupous deposits were distinctly adherent to the Peyer's patches, in the shape of elongated, continuous, or isolated plaques. The croupous membranes sloughed off easily, leaving superficial erosions. The mucosa of the colon was uniformly swollen, strongly congested, and throughout its surface covered with a continuous yellow croupous membrane. Similar conditions were found in the cæcum and rectum. The liver was congested, rather dark in colour, and friable. The gall-bladder contained thick yellow bile, with flakes of croupous membranes. The walls were thickened, the blood-vessels injected and the mucosa reddened and covered with the yellow croupous deposit. The spleen was normal, and so were all the lymphatic glands. The kidneys were somewhat congested and œdematous on section. The urine was normal and so was the vagina. The lungs showed an interstital emphysema; the heart was in diastole, filled with coagulated blood. There were a few petechiæ on the epicardium, none on the endocardium.

The above represents an acute case. In a subacute case which came to my notice, the croupous membranes were absent, and the inflammatory symptoms were but slightly pronounced. It seems to be the rule that the lesions of a simple gastro-enteritis and anæmia are the most prevalent on *post mortem*, and again anæmia alone may be noted.

Cause of the Disease.—The history indicated that this disease is of a contagious nature, and the symptoms described both in the living and the dead animal are strongly suggestive of rinderpest. To this comes the fact that it is observed in a country where rinderpest occasionally threatens to be introduced from Abyssinia, and indeed the Masai, who had some previous experience, promptly identified it with rinderpest.

The theory, therefore that it was rinderpest in a mild form, either attacking animals with inherited immunity from parents who had gone through a previous attack or a modified and attenuated contagion, had some support. From experimental facts rinderpest had to be excluded. Already Lichtenheld, with the blood of a sick animal, had inoculated quite a number of healthy ones, without producing the disease. Stordy, too, only obtained negative results. At my request Stordy repeated the experiments again with the blood of the animals on which we had made *post-mortem* examinations taken during life, and at the same time some control calves were placed in immediate contact. The result was that none of the injected animals took the disease, but the contact-control animals developed a fever after an incubation time of five days. This settled the point of the non-identity of the two, rinderpest being inoculable with blood. It is further noteworthy to state that the microscopical examination of the blood did not reveal the presence of any specific micro-organisms.

Although the mortality caused by this disease is nothing compared to that caused by rinderpest, it might perhaps be more serious to our cattle-breeders than rinderpest itself, because the latter disease can be effectively dealt with, whereas nothing could be done as yet against the new one. It is therefore advisable to be on the look-out and guard against its introduction.

CLOTHING AND CLIPPING HORSES.[1]

By General F. SMITH, D.S.O.

All lay writers on stable management have urged the necessity for hot or warm stables for horses; all veterinary writers have condemned the practice. Those who urge the system at the present day may be interested to know that it had its origin in the question of the amount of hair grown during the winter, at a time when clipping was unknown. Very little observation was sufficient to show that

[1] From the Annual Report of the Director-General, Army Veterinary Service.

the horse kept in the hot stable grew a far shorter coat than the animal in the cold stable, and this fact was the basis of a practice which was also incidentally found to favour the putting on of fat, and the production of a gloss on the coat.

Clipping was unknown or unpractised in this country until the early part of the nineteenth century. No reference is made to it in any of the old works on the care of horses which I have consulted.

Sir Francis Head, writing in 1860,[1] tells us clipping was imported into England during the Peninsula War. It was observed that the Spanish muleteers gave to the animals they had charge of great apparent relief by rudely shearing off the hair that covered their bodies, and on the idea being imported into England, our hunting men, principally at Melton, commenced the practice by clipping their hunters, at a cost, at first, of about five guineas. After the clipping process, which occupied four or five days, the horses were shaved, but this was attended by certain disadvantages, and the routine practice was to clip and keep the coat short by repeated singeing.

Such is the early history of a process which is now established as an essential feature in horse management.

Thirty years ago no one thought of clothing the body of the troop horse, but since the general introduction of clipping in the Service, there has been a very natural desire to replace in the form of a blanket that which has been lost by clipping. Many important changes have small, some even microscopic beginnings. When clipping was first introduced, it was limited to the belly and legs; it gradually crept up the body, and trace high became an established standard. It then began to find its way up the front of the neck, while bolder horse-masters took the hair off everywhere but on the back and loins, and in course of time even this disappeared. The evolution of the troop horse into the clipped hunter has taken many years, and on the whole, so far as limited clipping is concerned, the horse is the better for it. With the extension in the practice of clipping came the demand for blankets, a perfectly logical sequence, but representing extra cost in the maintenance of the horse, and therefore a subject for difference of opinion. At the present moment the necessity for clothing troop horses is one of the most prominent matters in horse management, and for this reason it is, perhaps, desirable to go into the question of cold and exposure more fully than would otherwise have been necessary.

1 "The Horse and his Rider."

The natural attitude taken up by the majority of people is that the horse must feel cold in winter, and that clothing is the remedy; while if the coat be removed by clipping, clothing is considered an absolute necessity.

The case as stated appears to admit of no argument, and it bears the imprint of common sense. On reflection, however, it is difficult to reconcile the necessity for clothing in stables with the well-known fact that the horse was born in the open and has lived there for the first three winters of his life without clothing. This is met by saying that under these conditions the animal was not clipped, and that the necessity for clipping alters the matter. There is reason for thinking that this view is incorrect, and we must, therefore, consider the question under two heads—viz., is clothing required by unclipped horses? Is it essential for those which are clipped?

Clothing for Unclipped Horses.—Most half-bred horses are foaled during the late winter or early spring. For eleven months the foal has been living at a temperature of not less than 101° F., but in the course of a few minutes (normal foaling is very rapid in the mare) the young animal finds itself projected into the world, and deposited on the cold or wet ground, the surrounding air temperature being near or even below freezing point. This sudden change in temperature does no harm, and the foal in a very short time is on its feet.

But the physiologist knows that profound changes have in the meantime been taking place in the young animal's body, that whereas previously no effort was required to maintain its heat, it now has to produce heat and to regulate the amount. Heat production and regulation are matters under the control of a distinct part of the nervous system. Immediately the young animal is born the process comes into operation,[1] and by its means the temperature of the body is maintained and regulated.

The body requires less heat in the summer and more in the winter; this is automatically regulated by the nervous system, the fuel being the food, the furnace the muscles, the nervous system the stoker. Examples of this law of production and regulation are numerous. Man can live on the Equator or over the Pole, the body heat remaining practically constant. And the same applies to horses. Jackson[2] has proved that these may live at 80° N. latitude for two and a half years, and not even on the ordinary diet to which horses

[1] Not so in all animals; there are many which at first are incapable of maintaining their own body heat, and need that of the mother; for example, kittens and puppies.

[2] "A Thousand Days in the Arctic," by F. G. Jackson.

are accustomed. This explorer's observations on equines in high latitudes are of the greatest interest, and his experiences will be again referred to.

Exposure to a low temperature renders the body very sensitive to a rise in the thermometer. Heat may be complained of in the snow house of the Esquimaux, in which the temperature does not rise above freezing point; and Jackson tells us that when the thermometer in July stood at its maximum, 8° above freezing point, it felt like midsummer, and was far too warm. To appreciate this fact, we have to remember his observations showed that in three years the thermometer never rose higher than 11° above freezing, while 70° to 80° below freezing, in a wind-stricken country, were quite common. Conversely, living in a high temperature renders the body more sensitive to a fall in the thermometer.

Quite apart from one's general knowledge, the facts mentioned above may be readily demonstrated by passing the hand from hot to cold water and *vice versa.* The cold water feels colder than it really is in passing from hot to cold, and the hot water seems hotter than it really is in passing from cold to hot. Applying this fact to daily life, it accounts for the feeling of cold in passing from a warm room in winter into the open air, and for the feeling of heat on passing from cold air into a warm room.

If a part be persistently protected against the air it becomes very sensitive to exposure; if it be habitually exposed a considerable degree of cold or of heat can be borne with impunity. A good example is afforded by our own hands and face; it takes quite a relatively low temperature to cause the hands to feel cold, while little less than an arctic winter produces a feeling of cold in the face, and this in spite of the fact that the large majority of men keep it hairless.

This fact relating to the influence of exposure explains the indifference of children to short and low dresses, bare legs, and the absence of socks or shoes. It explains why women, who at all times wear far less and lighter clothing than men, enjoy immunity to exposure in evening dress. It explains why the street arabs in the cities of the north can go about bare-footed and bare-legged on stone pavements in the coldest weather. Primitive man wore nothing more than his progenitor wears to-day. Few facts in his travels impressed Darwin[1] so deeply as the exposure the inhabitants of Tierra

[1] "Voyages of the *Adventure* and *Beagle.*"

del Fuego withstood in a naked condition, living in one of the coldest and most tempestuous climates in the world outside the Arctic circle. In some parts the only clothing worn was a small patch of skin the size of a pocket handkerchief fastened around the body by a string, the position of the patch being altered to meet the blast; many wore nothing whatever. The newly born were exposed like their parents, and the women at all seasons spent part of their time in the sea gathering food. The people did not die from cold; through long ages their nervous system had learned to regulate the heat supply, while exposure had conferred immunity. In a small way the fact is evident among ourselves; a man is not ordinarily conscious of baldness, or the exposure resulting therefrom, because the process is gradual. He cannot tell by any subjective feeling where the baldness ends and the hair begins. It is evident the skin of the scalp has contracted a comparative immunity to the sensation of cold. Turning once more to the naked savage, it is not until attempts to civilize them, by employing clothing and living under shelter, that lung trouble appears. Clothing and shelter weaken their resistance, and this has been proved true of all savage races brought under the destructive influences of civilization.

These examples have been chosen from man as they more directly appeal to general knowledge and observation, but there is no necessity to confine our observations to mankind; there are thousands of valuable stock which spend their life outside. Who troubles about the Highland and Shetland ponies spending their winter in the open? On hearing that a horse is being turned out for the winter, whoever thinks of asking whether the animal will receive clothing as a protection? The London cab-horse, clipped trace high, spends ten hours a day in the streets in all weathers; he wears no rug in the open, though occasionally one may be thrown over his loins. Finally, the thorough-bred brood mares of this country, and their stock, together worth hundreds of thousands of pounds, live in the open the whole year round without clothing.

It is not generally known that when horses are turned out it is seldom, unless they are ill, that they take advantage of any shelter provided. Rain will drive them under cover—there are few things they dislike more—but cold they apparently enjoy; on a bright frosty night they may be seen outside instead of under shelter, and even lying on the snow.

It is unnecessary to press this matter further. It cannot be doubted that the unclipped horse can live in the open without clothing,

but if he is to work and maintain his condition he must be fed. Jackson's ponies lived in the open during sledging expeditions, they wore one blanket, and were exposed to an almost constant blizzard with a thermometer 45° F. *below zero*, at night. It is difficult to imagine the intensity of this cold until we remember that it was as far below freezing point as summer heat is above.

Clothing for Clipped Horses.—The next point to consider is how far clipping destroys a horse's power of resisting cold. A horse clipped on a cold day very soon begins to shiver, arches his back, and his coat stares. He feels cold, and the heat-producing agencies (the muscles) by their rapid contractions (shivering) are producing more heat to meet the demand. There is nothing alarming in this shivering; the same will occur during the winter after a drink of cold water, and from the same cause. Still, it is a wise measure of precaution for a blanket to be worn for a day or two after clipping until heat regulation is established under the new conditions. This restoration is very soon effected; we can follow the process in ourselves after hair cutting on a cold day, or the removal of a beard. The loss of hair is distinctly felt, and may be evident up to the second day, but not later. This is a very close parallel to what occurs in the horse; a day or two after the removal of the coat the loss is no longer felt, and such animals may be exposed with as great impunity as an unclipped horse provided they are fed. The importance of this statement is considerable; its accuracy is based on probably not less than 3,000 observations, and is undoubted.

Neither coughs nor colds need be expected to follow this Spartan system; they will be quite unknown. Captain F. G. Jackson, to whose work I have previously referred, has courteously informed me that his ponies never had a cough or cold. Towards the end of his explorations the last pony died, the only one the death of which could be attributed to exposure, but the temperature froze mercury, and the animal's daily diet consisted of two or three dog's biscuits, a few dried vegetables, and bear's meat. Horses living in the open and performing hard work, especially if the thermometer be low, require to be well fed. Given that, they can be exposed with impunity.

Writing in 1816, Lawrence tells us[1] that in his day there were no horses in such hard condition as those running in mail coaches. He comments on the fact that these horses wore no clothing, and stood in stables with both doors and windows open; they were exposed to a life

[1] "The Complete Farrier and British Sportsman."

of hardship, bad weather, and severe work, such as no animal at the present day has to contend with.

In practice there does not appear to be any necessity for the hair to be removed by clipping from the entire surface of the body. Clipping trace high (leaving the hair on the legs) is ample to prevent sweating; modifications may be practised by clipping all but the back and loins.

The necessity of leaving the hair on the legs is urged by some, not only for protection against thorns, as popularly and erroneously supposed with a hunter, but also on account of the additional warmth. The skin of the legs has no sweat glands, so the legs do not sweat: whatever is seen there has run from above, and in advocating the hair being left on the legs, the fact of this skin not sweating is taken into account. In theory there is no necessity to clip parts which do not sweat, but in practice fashion and appearance take the place of utility.

If it be admitted that loss of heat occurs when clipping is followed by no blankets, and that this loss can to an extent be avoided by using them, the question naturally suggests itself, why not employ blankets?

The disadvantages of blankets in stables may be summarized as follows:—

(1) If one blanket is used in the stable, two will be required in the open.

(2) It is impossible to give two blankets to every horse on service owing to the increase in transport; they will at first have one, and as the difficulties in transport increase they will disappear.

(3) Blankets naturally favour the spread of skin disease, and on this ground alone their use should be interdicted in war, where mange is one of the first diseases to appear.

(4) Horses that wear no blankets are less susceptible to cold, harder, better fitted to stand exposure in the open, but they must be well fed and cared for.

(5) Blankets lead to "coddling." Units may be seen exercising their horses in blankets, draught horses on fatigue may even be seen wearing the harness over the blanket. The necessity for blankets has generally become so profoundly impressed, that there are commanding officers afraid to allow a troop horse to stand in the open, even for a few minutes, without a blanket being thrown over him, yet this animal may be required for war to-morrow!

The advantages of blankets are:—

(1) A smaller ration is required.

(2) The horse is kept cleaner and is therefore less trouble to groom.

(3) The coat wears a brighter look.

(4) The horse looks more comfortable.

All these points are conceded, but they are not of that nature to prove blankets a necessity. Facts are sometimes difficult things to explain, yet the fact remains that no one has yet seen a well-fed and cared for horse die from exposure to cold. We grant the additional comfort furnished by a blanket; but comforts are doubtful advantages, while actual necessities are few. The blanket-wearing horse has the whole of the belly and thighs exposed, but this is always forgotten, as the parts are out of sight, yet the exposed area is considerable, and judging from our own sensations the feeling of cold should be considerable. We know, however, that it is not so, and that the horse cheerfully lies on the cold and wet ground without contracting any chill through his exposed belly.

The "coat" of the blanket-wearing horse, no doubt, looks brighter, and possesses a sheen denied the other, but this is a mere question of appearance. There is a great difference in the appearance of the hair of a person wearing no hat from one who keeps the head covered; but the hatless man is immune to exposure, an asset of no little value.

Fortunately there are a few commanding officers who set their face against the use of blankets and depend on good stable management. In two of the most exposed military stations in the kingdom, Newcastle-on-Tyne and Shorncliffe, we have known animals without clothing the whole year, and no horses could look better.

ANTHRAX.[1]

Anthrax is a contagious disease caused by the *Bacillus anthracis* Human beings and all animals are liable to become infected. The disease, which shows itself suddenly, chiefly attacks cattle, pigs, and sheep, but horses are not uncommonly affected. It is very quickly fatal, usually within forty-eight hours, but in the United Kingdom it does not often spread with rapidity from animal to animal, though it may affect a number of swine at the same time time if they have been fed on flesh affected with anthrax.

Symptoms.—A beast, which a short time before appeared to be well, may be found dead, or in a dying condition, frequently with blood oozing from the nostrils and anus. In cattle there are no typical symptoms, but in horses and pigs the region of the throat is often found to be swollen.

Post-mortem Appearances of the Disease.—The carcase is swollen.

[1] A leaflet issued by the Board of Agriculture and Fisheries.

Blood is often found around the nostrils and anus. The muscles may be infiltrated with blood at certain points. The lungs and glands are congested. The spleen is very much enlarged; it is softer and darker than normal, and its substance usually resembles tar.

In most parts of this country the enlargement of the spleen in cattle is of great diagnostic importance, but in those districts where redwater exists, enlargement of the spleen may be due to this disease and not to anthrax. In such a case, however, the spleen substance has not the same fluid tarry appearance. In horses and pigs, and much less frequently in cattle, the spleen may be of normal size, although the animal has died of anthrax. The flesh is dangerous to animals and human beings.

Difficulty of recognizing the Disease.—One of the greatest of the difficulties which present themselves in dealing with this disease is that the symptoms during life are not such as to lead a person who is unacquainted with anthrax to suspect the presence of the disease. Moreover, the death of the animal attacked often occurs when the owner or attendant is absent. It frequently happens that an animal which has sickened is killed, or that the carcase of an animal dead of anthrax is cut up, and the blood, which is the main source of danger, is freely spilt about the premises or on the soil. The disease is in this indirect manner spread to other animals, and in some cases the persons who have handled the carcase contract it. In every case of sudden and unaccountable death amongst stock the owner of the animal should await a skilled opinion before disposing of the carcase.

Anthrax or Suspected Anthrax to be Reported.—Every person in Great Britain having or having had in his possession or under his charge an animal (that is, a ruminating animal, pig, horse, ass, or mule) affected with or suspected of anthrax is required by law to give notice of the fact with all practicable speed to the police. Failure to give such notice renders a person liable to a fine of £20, and in certain circumstances to a month's imprisonment with hard labour.

It is the duty of the Local Authority under the Diseases of Animals Act on receiving such notice to institute inquiries, and to make proper provision for the disposal of the case of any animal suspected of anthrax, and for the disinfection of the premises upon which disease has existed. The Inspector of the Local Authority is also required to give information to the Medical Officer of Health.

Precautions to be taken pending Inquiry.—Pending inquiry the owner can do much to assist in preventing the spread of the disease amongst his stock, and it is clearly to his own interest that he should do so.

The sick animal should on no account be killed, but should be carefully isolated from all other animals. Should it die before the arrival of the veterinary inspector the carcase must not be dragged along the ground, but should be allowed to remain where it is, until the examination has taken place. It is essential that the carcase of the animal should not be cut or opened, and steps should be taken to prevent the escape of blood or of excretions which may contain blood. Precautions should also be adopted to prevent the possibility of any person or animal obtaining access to the carcase, or to any blood which may have exuded therefrom. As an additional precaution quick-lime may be freely spread on the floor or on the ground surrounding the carcase. Animals with which the suspected animal has been in association should be carefully watched, and isolation at once adopted in the case of the appearance of symptoms similar to those of the suspected animal. Such precautions are particularly necessary in the case of milch cows affected or suspected of being affected. The milk of these cows may contain anthrax bacilli, and so be the means of infecting human beings.

Procedure of the Local Authority.—Local Authorities are required by Article 3 of the Anthrax Order of 1899 to obtain the assistance and advice of a veterinary inspector in all instances in which anthrax is reported to them. Although the clinical symptoms may in many instances justify a veterinary inspector in forming the opinion that anthrax exists, it is desirable that his diagnosis should be supported by the positive evidence of a microscopical examination of the blood of the suspected animal. Such examination, if the specimen be obtained soon after death, is by no means difficult. The specimens should be taken in duplicate and carefully preserved for future reference.

Investigations as to the origin of the outbreak should include careful inquiries as to the use, for or about the animals, of manufactured feeding stuffs, or bone and other artificial manures, as such substances are known in some cases to have been the media by which the disease has been introduced. The possibility of infection being conveyed by the water which the animals drink should not be overlooked.

It is very advisable that the owner of all cattle, sheep, or swine which have been in association with the diseased or suspected animal, and are pronounced by the veterinary inspector to be apparently healthy, should move them under the supervision of an officer of the Local Authority from the shed, or field, or place where the disease has originated, to some other place on the farm or premises where they can be isolated and kept under observation. The period of incubation of

anthrax is short, and seven days will, as a rule, suffice to enable the veterinary inspector to determine whether any of these animals have become infected or not.

Disposal of the Carcase.—Special attention should be given to the disposal of the carcase of an animal dead of anthrax. Cremation upon the spot where it died is, where possible, the safest method of disposal. Information on this subject has been issued to Local Authorities by the Board. If it is necessary that the carcase be moved to some convenient spot for the purpose of cremation, the nostrils and all the natural openings should be carefully plugged with hay or tow saturated with a strong solution of carbolic acid, in order to prevent the oozing of any blood therefrom. The dragging of the carcase along the ground is to be avoided. Where burial is resorted to the grave should be dug in some part of the farm, remote from any watercourse, to which animals cannot or do not ordinarily have access, such as a wood or enclosure. The method of burial is prescribed in the Anthrax Order.

The disinfection of the place or premises where a diseased animal has been detained or has died is then to be carried out in the most thorough manner of which circumstances admit. All manure, or broken fodder, remaining thereon should be disinfected or destroyed by fire.

General Observations.—It is important that it should be widely known that anthrax is due solely to the introduction of the bacilli or spores of anthrax into the blood of an animal or of man. The disease may therefore be introduced by any medium capable of conveying these germs or spores. Feeding stuffs brought on to a farm, or manures made from animal substances, may be vehicles of infection. If a stream becomes contaminated, as has been found to be the case where certain industries involving the use of the hides, hair, &c., of animals are carried on, the spores may be carried to the farm by the water. The spores of anthrax develop into bacilli which find their way into the circulation of an animal through a cut or abrasion.

Where infection has once been introduced upon a farm it has frequently been continued by the ignorance or carelessness of individuals, and in some cases farms have become permanently infected with anthrax.

It is a common practice amongst owners of stock to slaughter their cattle as soon as they present symptoms of serious illness, in order that the carcase and hide may be utilized. Where, as is not uncommonly the case, the sudden illness is due to the presence of anthrax, the greatest mischief is done by such a practice. The

blood of the diseased animal is distributed on the ground, or it may be on the floors of the cattle shed or upon the mangers, or is carried on the boots of the attendants to other parts of the farm or premises. The bacilli contained within the blood of a diseased animal will, when exposed to the air, multiply and produce spores which may become the means of infecting other animals at short or long intervals. Many cases have come under the notice of the Board from time to time of persons having contracted anthrax whilst engaged in slaughtering animals, or in dressing or otherwise handling the carcases of animals. During 1908, in addition to forty-seven cases of anthrax (of which seven were fatal) in factories and workshops, there were twenty-two cases (two fatal) in other industries. Of these, ten occurred among butchers and slaughterers and five among farm labourers.

On the other hand, the bacilli anthrax die if kept within the intact carcase of an infected animal; no spores are formed; and experience has shown that, where the precautions recommended above have been scrupulously adhered to, the disease frequently ceases after the death of one animal on the farm.

Preventive Inoculation.—The Pasteur method of preventive inoculation has rendered great service in preserving stock on badly infected farms in various parts of the world. The method consists of injecting the animals with fixed doses of attenuated cultures of the *B. anthracis.* Two injections at intervals of twelve days are performed. For the first injection a very attenuated culture is used (first vaccine), and for the second one employs a less attenuated culture (second vaccine). The immunity is established about twelve to fifteen days after the second vaccine has been injected. In cattle it lasts about a year, and should be repeated after this period unless the ground has become purified. The great majority of cattle operated on show little more than a temporary indisposition with passing fever after the injection, which may be assumed to indicate a mild attack of anthrax. Occasionally, however, an inoculated animal may die of the disease as the result of the injection, and for this reason the animals while undergoing the process of immunization should be kept in a special paddock, or better still in sheds which can be disinfected in the event of an accident taking place. The operation should only be attempted by skilled persons, who will know the best way to prevent an accident, and guard against its consequences should it occur.

Since the operation is not altogether unattended by the possibility of loss, and since it incurs a certain amount of expense, one has to consider under what circumstances it will be worth while undertaking it. It will be obvious that on farms registering only one death

annually it will hardly be called for, and that it would be folly to adopt it on clean farms.

It results from observations on several millions of cattle in various parts of the world that accidents occur in about ·5 per cent. of the inoculated cattle taken all round, and that the operation may be expected to reduce the death-rate from anthrax on infected farms to about 1 per cent. or slightly under.

If a stockowner finds that his annual losses from anthrax amount to 2 per cent. he will possibly find it profitable to have recourse to preventive inoculation.

It should be understood, however, that since the number of animals dying of anthrax in one year will vary, and since the inoculation must be repeated annually, the estimation of annual losses must be based on two or three casualties.

A certain degree of temporary immunity can also be almost immediately conferred by injecting a dose of anthrax serum, and the injection produces no accidents. Where animals have been exposed to the risk of what might be called gross infection (for example when a carcase has been carelessly dealt with on a pasture) it is advisable to inject them immediately with serum, and remove them to another field.

Farmers invited to assist Public Authorities.—Stockowners are, therefore, earnestly invited to co-operate with the public authorities.

(*a*) By reporting every case of sudden and unexplained illness or death, especially amongst cattle, to the police;

(*b*) By isolating the ailing animal, or by protecting the carcase from persons or animals pending the arrival of the veterinary inspector;

(*c*) By giving every facility to the officers of the public authorities in carrying out the precautionary measures enjoyed by the Anthrax Order; and

(*d*) By affording such officers every assistance in their power in tracing the origin of the outbreak.

They are further strongly recommended to give positive orders to their servants that under no circumstances is an ailing beast to be killed by them, or its carcase opened, where the cause of sickness or death is unexplained.

The Board have prepared a short notice (A 375/A) dealing with the principal points above set out, suitable for posting up in byres or sheds. Copies can be obtained gratis and post free on application to the Board, 4, Whitehall Place, London, S.W.

Clinical Articles.

TWIST OF THE DOUBLE COLON.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

Subject.—A cart gelding, aged 7.

History.—Showed symptoms of abdominal pain at 4.30 a.m., and was given one of the usual colic draughts, consisting of chloral hyd. ℥i., ol. tereb. ℥ij., ol. lini oiss. When attended at 10 a.m. the following symptoms were observed: Intermittent struggling, the fore-feet striking the wall of the box in a violent manner; animal frequently lay on his back, during which time the hind limbs crossed each other in a peculiar manner; when attempts were made to get him on his feet he sat on his haunches and remained in this position for some time.

Very slight tympanites, but the abdominal muscles were hard and tense; pulse very weak; expression of countenance anxious; visible mucous membranes injected. Bowels had acted once.

Diagnosis.—Probably volvulus.

Prognosis.—A fatal termination.

Treatment.—Continued doses of chloral hydrate. Death occurred at 4 p.m. same day.

Autopsy.—Same evening. The peritoneal cavity contained a large quantity of yellow-coloured serum. The cæcum did not make its usual appearance when the abdominal cavity was opened, and the colon seemed firmly bound down. After a search the cæcum was discovered out of its usual position, the apex being close to the diaphragm. This intestine was very anæmic, and was perfectly empty. On removal of the double colon its external aspect was dark in colour; its second and third divisions were found to have a double twist close to the supra-sternal and diaphragmatic flexures.

The colon throughout its entire extent showed acute enteritis, the mucous membrane was almost black in colour, and the ingesta blood-stained.

Remarks.—No rectal examination was made. Judging by the difficulty experienced in getting rid of the twist when the colon was laid on the ground at the autopsy, it is quite clear that any therapeutic measures for the relief of the condition could not be successful. I cannot account for the altered position of the cæcum,

its anæmic appearance, and the fact that it was perfectly empty. The slight degree of tympanitis present is also a matter for comment. The contents of the colon were perfectly soft in consistence.

The etiology of twists of the double colon is still a mystery.

A CASE OF SUPRA SCAPULA PARALYSIS.

By Captain G. P. KNOTT, A.V.C.

History.—The subject was a thoroughbred Australian mare, aged 5, which was at the time a partly trained polo pony. Whilst being led at exercise she fell, getting the off fore-leg into a large deep ant-bear hole, which caused her to fall violently on to the right shoulder. She rose immediately, and no injury was noticed until on being asked to move she did so in such a manner that it was thought she had sustained a fracture of the shoulder. The accident occurred on March 1, 1907. The mare was then placed in slings, and I saw her first two days later.

Symptoms.—These were typical. When the mare was walked in a straight line the shoulder, when weight was placed on the limb, was jerked away from the chest wall, and, in fact, looked as if only held in place by the skin. When the leg was carried forward abduction was caused. The absence of pain, heat, or crepitation immediately settled any question as to the possibility of fracture.

Treatment.—The mare was kept in slings for a few days longer, with the idea of accustoming her to being on three legs, while hot fomentations were continually applied to the shoulder. She was then placed in a loose box with sawdust bedding, and a course of massage with mild, stimulating liniments was carried out, twice daily for half an hour each time. This treatment was followed until May 10. But the supra and infra spinatus muscles became more wasted every day, and by this time had almost, to all appearance, vanished. The spine of the scapula was so prominent as to be distinguishable some distance from the mare, and the shoulder felt, on each side of the spine, as if the scapula was only covered by the skin. From this date slight improvement seemed to take place, and a gradual reappearance of the muscles could be appreciated. The massage was now discontinued and the shoulder blistered.

May 25. The mare was sent to walking exercise. From this point improvement was more rapid, exercise being continually increased as the animal gained strength, blisters being applied at intervals.

August 15. Trotting exercise, which after a little was increased to slow cantering.

October 15. Placed at ordinary polo work, schooling, &c.

January 1, 1908. Played polo, and continued to do so without apparently experiencing any inconvenience from the affected leg, which by this time had almost regained its normal size. She now became a first-class polo tournament pony. During all this time every effort was made to keep the mare in good healthy condition, strychnine powders being given from time to time.

Remarks.—It occurs to me that many cases which are put down to shoulder lameness, exact position unknown, may be due to a slight affection of this nerve, particularly where much wasting of the muscles is observed and symptoms of "supporting leg-lameness" are prominent. I have seen many cases of what I considered shoulder lameness, and many have been pointed out to me as shoulder lameness, but in none have I ever seen wasting so marked as in this disease. From the anatomy of the region, and its exposed position, I should think that a great many more cases occur than the text-books and recorded cases lead us to believe.

It may be argued that the expense of keeping an animal invalided for so long would be more than it was worth. This may be the case with old animals, but it was not so in this instance. The mare was originally bought for £20, when she had been lame for a month; the following year, after having played several tournaments, her owner sold her for 50 gns., and told me that had its history not made buyers sceptical as to the affected leg standing prolonged work she would have sold for much more. Some months later I heard that the animal was still going sound.

CYSTS ON THE ANTERIOR SCAPULAR REGION.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

These are not uncommon in country horses, especially in young animals when first put to work. The usual site is over the antea-spinatus muscle.

Some are rather extensive in size; they have a thick wall which is firmly attached to the intermuscular connective tissue, they contain a dark yellow fluid, and the interior of the sac is smooth.

As regards treatment, simple incision along the length of the sac,

removal of the contents, and plugging the cavity with tow soaked in tr. iodine will suffice in some cases. In others the best treatment is to excise the sac; this will prevent a recurrence. When the sac is diffuse, it is not possible to excise it intact, as the walls are deeply attached to the underlying muscles; it may first be opened and the wall can then be dissected away. I have not found it possible to obtain healing by first intention, even when aseptic precautions are carried out as far as can be done.

A "BULL-DOG" CALF.

By R. WAGHORNE, V.S.

Edenbridge.

MALFORMATIONS in calves are by no means rare, and the forms they take are very curious, but I have never before seen one so much like a bull-dog in shape and size as a monstrosity which I removed from a young cow at her second calving a few days ago. This cow went her full time of forty-one weeks, and was in labour for an hour and a half. As the case did not seem to be making progress towards delivery, I was summoned to render help, and after some little manipulation removed a calf with a thick short skull, a face very like that of a bull-dog, and a short squat body with a foot attached at either corner, but without any leg bones whatever. It was alive when born, and survived for about an hour, shaking its head and opening and closing its eyes. It did not, however, make a noise of any kind.

The cow eventually did well.

CYSTS IN THE MAXILLARY SINUS.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

I HAVE had two cases of the above, both in young horses. The symptoms were a loud snoring sound during inspiration, marked bulging of the submaxillary bone in the affected side, and a slight muco-purulent nasal discharge.

On trephining the cases, the bone is found to be very thin, and the instrument goes through when slight pressure is applied. A very large amount of straw-coloured fluid escapes.

After-treatment consists in washing out the sinuses and keeping the openings patent for some time. Both cases made a good recovery.

CAVERNOUS ANGIOMA OF THE LIVER OF A COW.

BY A. M. TROTTER.

Glasgow.

KITT, in his text-book of "Comparative General Pathology," classifies angioma of the liver into capillary telangiectasis and cavernous. The former is the term applied to that variety which is so frequently found whilst making autopsies on aged animals slaughtered for food. It is with reference to the latter variety that this note deals.

The subject was an aged Irish cow in poor condition. The liver was smaller than normal. At the extreme end of the left lobe was an enlargement which was afterwards found to measure 5 in. by 4½ in. by 3 in. The surface of this enlargement was composed of fibrous tissue, and the liver parenchyma was found extending in a greater or less degree for some distance over it at its edges. On manipulation it was, as a rule, soft and doughy; but in places it was hard, rotund, and movable, indicating the presence of bodies in the substance of the mass. On incision, a large quantity of dark-coloured blood escaped. The mass was oval in shape, sharply defined, and limited by a dense fibrous capsule, evidently formed through pressure at the expense of the normal liver tissue. From this capsule there were given off bands of fibrous tissue, which, by dividing, subdividing, and uniting, formed a well-marked network, giving the cut surface in some places the appearance of erectile tissue, in others that of a sponge. From the interspaces thus formed the blood above referred to oozed. The trabeculæ varied in thickness, and in the case of some of the larger interspaces the inner surface was observed to be smooth and glistening. To the touch the cut surface was smooth and soft, with here and there a distinct "shotty" sensation, due to the presence in a number of the spaces of hard bodies, which, on examination, were seen to be thrombi, varying in size according to the calibre of the containing space—some of the thickness of the thumb, but the majority of the size of a vetch or large pea. They were, as a rule, of a dark colour, but occasionally they were mottled, white, grey, or yellow. Some of these bodies had been severed by the incision, and, on the cut surfaces being pulled apart, some of the severed portions became detached, while others protruded from the cut surface and were found to be attached in a greater or less degree to the trabeculæ. The surface of these thrombi were either smooth or slightly uneven, and often cut up by sulci, giving them the appearance of being slightly ridged. When cut they were

seen to be formed by concentric laminæ, and the mottled appearance was seen to be due to alternating layers of different hues. In the centre of some of the larger thrombi was found a calcareous deposit. Throughout the liver were numerous small capillary telangiectases, and the liver itself was markedly affected with cirrhosis, due to the presence of *Distoma hepaticum* in the bile-ducts.

Microscopical Examination.—The stroma was composed of loose, fibrous tissue, as a rule densely cellular, and contained numerous blood-vessels. The spaces varied in shape and size. Some had a tendency to rotundity, whilst others were irregular. The endothelium was in places well marked, but at others had become obliterated and replaced by a dense deposit of cells, many of which were undergoing chromatin degeneration. At the edge, the endothelium could be traced for a variable distance into these cellular deposits, in which it finally became merged. Blood corpuscles were seen to have penetrated into their interior. They were evidently leucocytes and plaques deposited through the slowing or cessation of the flow of blood. These cellular deposits were undoubtedly the beginning of thrombi. From their free margin were given off branches, which, penetrating into the lumen of the space, joined the blood contents. In many of the spaces well-marked thrombi, composed of fibrin and cells, were present. Some of these thrombi were seen to be undergoing organization. In one or two instances the organization of the thrombus was complete, and what had formerly been a blood space was now filled by fibrous tissue, the limiting wall of the pre-existent space being quite apparent. In one or two instances canalization of the thrombus had occurred. In the interior of some of the thrombi, and also in some parts of the stroma, crystals of hæmatoidin were present.

Professor Wooldridge has been appointed Treasurer *pro tem.* for the National Veterinary Association during the regrettable illness of the Hon. Treasurer, Mr. J. F. Simpson. He would be glad to receive the members' subscriptions at their earliest convenience.

It is reported that Lieut.-Col. Joslen, F.R.C.V.S., Indian Civil Veterinary Department, has met his death as the result of a trap accident in India.

Canine Clinical Notes.

AN INTERESTING SPLEEN: A CASE OF HODGKINS' DISEASE.

By D. FORWELL, M.R.C.V.S.

Towcester.

The patient, a well-bred bull-dog, aged 5 years and 9 months, had been in the owner's possession for about two years, and I had known the dog during the whole of that time. He was apparently in good health until four months ago, when it was noticed that after exercise he became tired and breathed abnormally, coughing and retching occasionally. About six weeks ago I discovered a couple of enlarged glands in the throat, just in front of the sternum, and these have steadily increased in size until at the present moment they are each about the size of a hen's egg. Two others also developed in the hind-quarters, one on each hind-leg, just above the hock in the gastrocnemius muscle. All were freely movable under the skin. The body temperature varied between 102° F. and 103° F., and about six weeks ago I removed a tumour about the size of a pullet's egg from the region of the groin, where it was in the position of an inguinal testicle; and at the same time I removed the right testicle, as it was abnormally placed, and close to the tumour. This wound healed well and gave no trouble, but as the dog began perceptibly to waste away, about three weeks afterwards, I discussed with the owner the question of further advice.

At my request Professor Hobday was called in consultation, and the case being deemed hopeless, the patient was chloroformed to death.

Post-mortem examination revealed the presence of a large group of five tumours in the pleural cavity, adherent to the pleura itself, and each about the size of a walnut. There were two others on the mesentery. The liver was enlarged, but not otherwise diseased. The kidneys were normal, but the spleen was enormously enlarged, weighing 2 lb. 5½ oz., and measuring 18 in. long by 5½ in. broad, and a thickness of 2 in. in several places.

The specimen was sent to Sir John McFadyean, who kindly informed me that it was a typical case of Hodgkins' disease.

CHRONIC NEPHRITIS IN THE DOG.

BY E. WALLIS HOARE, F.R.C.V.S.

Cork.

Subject.—A fox-terrier dog, aged about six years.

History.—For some time the animal has been gradually becoming emaciated; the appetite is capricious; marked anæmia is a prominent symptom, the gums being very pallid.

Examination of the heart shows a markedly increased cardiac impulse, also palpitation produced by the slightest exertion, and accelerated respirations. No abnormality of the cardiac sounds could be detected, no thirst, and no renal symptoms. The animal became more emaciated, and one morning was found dead.

Autopsy.—The right kidney was atrophied to a surprising extent, the capsule was firmly adherent, and the surface of the organ irregular, and in section the texture was so tough as to almost resemble cartilage. The left kidney was not so extensively diseased, but showed marked resistance to the knife. The colour of both organs was pale. The heart showed the left ventricle to be hypertrophied to an extensive degree.

Remarks.—The absence of renal symptoms in the above case is interesting. There is no doubt but that renal diseases are far commoner in the dog than is usually imagined. The connection between chronic nephritis and canine typhus is an interesting point to the clinician. In many instances the primary symptoms of canine typhus are those attributable to a renal affection—viz., stiffness in the loins, frequent micturition, marked thirst, emaciation, and albuminuria; these are followed by the classical symptoms of the disease. It is probable that in such instances the renal affection was present prior to the attack of canine typhus, although causing no appreciable symptoms.

Abstracts and Reports.

REMARKS ON THE TREATMENT OF WOUNDS.[1]

By Sir W. WATSON CHEYNE, Bart., F.R.S., F.R.C.S.Eng.

Senior Surgeon to King's College Hospital, &c.

About a year ago in the Bradshaw lecture[2] I went into the subject of the treatment of wounds, and pointed out what I considered to be the essential factors to be attended to in trying to obtain an aseptic result. I also ventured to criticize some of the details of the methods which are so generally employed by surgeons at the present time, and which seemed to me to be imperfect from a bacteriological point of view, and thus were apt to lead to failure in securing the desired result.

It is most unfortunate that the idea seems to have grown up that the success or non-success of the treatment of wounds depends to a large extent on the materials used, and on the method by which the sterilization of these materials is effected.

The result of this idea is that the failures in avoiding suppuration are apt to be attributed to the use of this or that material, or of this or that method of sterilization, rather than to the true reason—namely, failure on the part of the surgeon to meet the bacteriological requirements of the case. Hence we have the extraordinary craze at the present time to banish the use of antiseptics, the failures being attributed to their employment and not to the real cause—namely, faulty manipulations on the part of the surgeon. As a matter of fact, efficient sterilization of the instruments, materials, &c., can be brought about in various ways, but the ascepticity of the results depends essentially on the care that is taken to prevent re-infection of the hands of the operator and his assistants, the instruments, materials, &c., during the course of the operation, for if these become infected again sepsis in the wound may very readily follow.

The discussion which is going on about what is falsely called aseptic treatment as against the use of antiseptics is utterly unscientific, and misses the real point at issue. It reminds one of the early objections raised against Lister's work. Many, under the impression that the essence of it was the use of carbolic acid, began washing their wounds with carbolic acid, and naturally failed to get the desired results. They accordingly wrote and spoke against the method, but they failed to recognize that the essence of the matter was not the use of carbolic acid, but the way in which it was used. So at the present time the stress which is laid on the fittings of operating theatres, the use of masks, rubber gloves, dry swabs, and all the other paraphernalia which are the fashion just now, is apt to overshadow the real point in obtaining an aseptic result—viz., what the surgeon

[1] See paper on "A Comparison between the Antiseptic and Aseptic Methods of Operation, with Special Reference to the Occurrence of Suppuration," based upon the results obtained at St. George's Hospital during the years 1906 and 1908 respectively. By H. S. Pendlebury, F.R.C.S.Eng., and Ivor Back, F.R.C.S.Eng. *Lancet*, November 27, 1909, p. 1578.

[2] See Veterinary Journal, February, 1909.

is doing with his hands. It is in the manipulations carried out by the surgeon that the real essence of the matter lies, not in these various fanciful surroundings. The personal equation of the operator has more to do with the result than anything else.

There are certainly two schools at the present time, but the essential point of difference is not whether use should be made of antiseptics in the course of an operation or not. The essence of the question at issue is whether the treatment of wounds shall be looked on as a bacteriological problem or not. On the one hand we have those, among whom I may include myself, who look on the treatment of a wound as a bacteriological problem of a complex character, and who take advantage of anything which aids in fulfilling the bacteriological requirements of the case, not forgetting, of course, that the tissues themselves have to play an important but secondary part. The other school looks on the action of the tissues as the essential element and the bacteriological question as of secondary importance. They try, therefore, to irritate the tissues as little as possible, and sacrifice various things which would be of value if the case were regarded as a bacteriological problem. In doing so they are apt to be led away by the non-essential surroundings, and forget what an element the personal equation plays in the result. It is, I fear, too often a case of keeping the outside of the cup and platter clean. In my opinion, this view is a very serious fallacy, and the essential point is what the surgeon does with his hands during the operation, and not the surroundings in which he operates.

I have felt certain for a long time that the results obtained by those who endeavour to do away with the use of antiseptics, and who rigidly employ what is falsely called the aseptic method, cannot be compared with those who are got when the treatment of a wound is looked on as a problem in bacteriological work, and when the surgeon acts accordingly. Till recently, however, I had no actual statistics at hand as regards the frequency of suppuration in wounds treated by the recent methods, and consequently I have always felt that, though I was right, my argument was not altogether convincing, seeing that I could only speak generally. This difficulty has, however, been remedied by the publication in the *Lancet* of November 27, 1909, of the results of the so-called aseptic method which have been obtained at St. George's Hospital.

Before, however, I go on to refer to these results I may mention a few of the points on which my conclusions adverse to this method were founded. In the first place, this so-called aseptic method, with its sterilizers, boiled water, heated towels, dry swabs, dry dressings, saline solutions, masks, &c., is full of loopholes, and does not in any way meet the bacteriological requirements of the case. To wash the skin with soap and water, even though the water is boiled, and then rub it over with a 1 in 500 solution of biniodide of mercury and spirit, is not in any way a reliable method of sterilizing the field of operation. To lay instruments on a dry, sterilized towel, and to work with them for perhaps half an hour, or an hour or more, without re-sterilizing either them or the hands of the surgeon or his assistants is utterly opposed to any real attempt at keeping wounds aseptic. To wear the same overall during a whole afternoon's operations, even though it was sterilized in an autoclave in the first instance, is hardly consistent

with asepsis. To put on this sterilized overall after the hands have been washed, but before they have been disinfected, as is so often done, is to infect it at once, still more so to put it on and then subsequently arrange blankets, &c. What bacteriologist would ever dream of carrying out his work under such conditions? No doubt the answer is that the tissues themselves have a great power of dealing with organisms which come in contact with them, provided that the latter are not too numerous or too virulent, and provided that the tissues themselves are very tenderly dealt with, so as not to impair seriously their power of resistance. This is, no doubt, to a certain extent true, and very fortunately so; but one must not try the tissues too far, or place too much reliance on their action. The less the tissues have to do in the way of destroying bacteria the greater the probability, and, I may even say, the certainty of securing an asceptic result.

As regards the imperfections of these methods, I also judge by the way in which many nurses who have been trained in hospitals where these plans are carried out act at an operation as indicating the training which they have received and the ideas which they have gathered from it. Nurses are always using the terms "sterilized" and "aseptic," but the majority of those whom one comes across in private practice have no real conception of their meaning. Ask a nurse who is wearing rubber gloves which have been well boiled, and who has perhaps been washing sponges in sublimate solution, and whose gloves are thus perfectly aseptic, to come and hold a retractor. What is the first thing that she does? Instead of coming promptly she rushes off to a tap or basin of water and carefully rinses off the antiseptic and soils her gloves, and then comes beaming with satisfaction at having demonstrated how thoroughly aseptic she is. Her annoyance when I decline her assistance after this performance cannot be concealed, and she evidently regards me as an extreme faddist and quite behind the times. Only quite recently I had two "aseptic" nurses to assist at an operation, who, having by my direction boiled some towels to surround the area of the operation, and, not having a basin at hand, placed them in the commode till they were required! I could fill pages with the absurd errors which I have seen, and which would be highly amusing if they did not imperil the well-being of the patient. One would have expected that, coming from a hospital where these difficult aseptic methods are employed, the nurses would have been especially thoroughly drilled in the extreme care that it is necessary to exercise in every direction during an operation if there is to be any certainty of success as regards the occurrence of sepsis. But, on the contrary, I find that so long as the instruments or materials have been immersed in boiling water, for however short a time, or heated in one of the imperfect sterilizers which are on the market, everything is all right, whatever may have happened to these things since they were prepared.

Further, I frequently hear the experience of medical men who have been visiting hospitals abroad and at home where this treatment is carried out, and their reports of the aseptic results as obtained by the modern methods are not particularly favourable, and they constantly express themselves puzzled as to how we obtain the results which we do at King's College Hospital, where our operating-theatre

cannot be said to be in any way a model of a modern operating-theatre.

I have also been very much impressed by what one hears of the difficulty of sterilizing ligatures, skin, &c., and of the frequency of stitch abscesses (I have known a large collection of pus in the pelvis after a clean ovariotomy spoken of as a stitch abscess), things which very seldom come under our notice, and I have been especially struck by the incredulity which is evident when, in discussing these matters, I have said that I have had little or no experience of them. The conversation is at once dropped, evidently from a desire not to lead me to imperil my immortal soul by further perjury. As an example of this point, and the results generally obtained in Germany, I was very much interested, in reading Bier's "Text-book on Hyperæmia," to come across the following remarks on p. 287 in the English translation. In speaking of the treatment of infected wounds, he says: "Not infrequently laparotomies which cannot be executed asceptically, and even radical operations for hernia, are followed by a mild, small infection leading to the formation of sinuses."

And again, on p. 334, in the course of some remarks on the prophylactic treatment of wounds suspected of infection, he says: "In connection with this experience [the failure of the hyperæmic treatment in some cases] are experiments which I have undertaken with a view to change the aseptic treatment of wounds. It would be incredibly foolish for a surgeon to question its brilliant accomplishments. But, in spite of asepsis, we have not yet progressed so far that we can guarantee with certainty the healing by first intention of all wounds adapted to suture. How often, for example, does it occur that silk threads are expelled, or that a wound which, on the whole, has healed by first intention shows small defects (stitch abscesses, sinuses)!"

These are to me astonishing statements, and what astonishes me most is the matter-of-fact way in which these failures are spoken of, as if they were everyday occurrences. If I had a "small defect" in a wound I should be very seriously unhappy, and should not rest till I had tried to find out what was the error which I had committed.

The result of these experiences is manifested in various ways. Thus we have many surgeons objecting to buried sutures for the reason that they are very apt to be extruded. We have, again, various devices for bringing together the edges of the skin so as to avoid if possible the occurrence of stitch abscesses. We have the abandonment by surgeons of many useful materials, such as catgut, marine sponges, &c., on account of the supposed difficulty in disinfecting them, the idea being that nothing but heat is a trustworthy disinfecting agent. To show how this fear of the danger of infection, which can only be inspired by experience, affects the conduct of an operation, I may mention that I have more than once had remarks made to me by distinguished visitors as to the mode in which I deal with the sac in performing radical cure of hernia. In the great majority of cases, for reasons which I need not go into here, I twist the sac and push it upwards under the abdominal wall, and the objection that is made is that in leaving a sac so tightly twisted as I do I am leaving a piece of dead tissue which will lead to suppuration. I can only say that in my experience this has not occurred, and that

even if it were dead, which I doubt, to leave a piece of dead tissue, provided that it is aseptic, is a matter of little or no consequence from the point of view of infection, provided the measures employed for keeping out bacteria are really efficient.

In yet another direction I notice the way in which the experience of those who employ this aseptic treatment affects their practice—viz., that they hesitate in doing things which can readily be done safely, and which ought to be done. For example, quite recently a distinguished orthopædic surgeon, in speaking of "tuberculous abscesses," stated that "numbers of children die in consequence of the routine opening of tuberculous abscesses," and he holds that better results are obtained if these abscesses are not, as a rule, dealt with at an early period. This is quite contrary to our experience, and is, to my mind, only another example of the failure of the so-called aseptic methods. That these methods should fail in such a condition as a psoas abscess is only what one would expect, because there we are dealing with an opening in the tissues, lined by healthy tissue with its strong anti-bacterial powers, but with a cavity containing putrescent material, the walls of which are themselves composed in great part of degenerated devitalized tissues. That is just the sort of case where we would expect failure, and it is evident from the passage I have quoted that this expectation is correct. On the contrary, the success obtained by dealing early with psoas abscesses was one of the points of which Lord Lister was always most proud, and we, who have been his immediate pupils, find that this success can still be obtained even to a larger extent than formerly.

I have referred to the results obtained at St. George's Hospital, as published in the *Lancet* of November 27, and I may now make a few remarks with regard to them. In the first place, it seems to me that the gentlemen who collected the results are quite satisfied with them, and in fact they end their paper by saying that "We hope that these statistics will prove useful and of interest to the practitioner, and help him to give a patient a fair idea of the average chance of aseptic healing in the commoner operations." The main object of the paper appears to be to contract the results which they obtained at St. George's Hospital in the first place when they employed antiseptics, in what way is not exactly stated, and in the second place since some alteration was made in regard to the use of antiseptics. It is not really clear from the paper what the alterations were, but in any case the results as obtained in 1906 by the methods then employed, which they speak of as antiseptic methods, were 13·6 per cent. of septic cases, falling in 1908 under improved methods to a percentage of 7·2 of septic cases. As the details of the two plans are not fully given I cannot criticize them, but it strikes me that probably the whole difference in the results is accounted for by the fact that in the second period nearly all the surgeons used rubber gloves ; in the earlier period this was apparently not the case. There is no doubt that boiled rubber gloves are of the greatest value where the methods of disinfection of the skin and especially of the hands, are faulty, and I believe that this point forms practically the essential cause of the difference between the results in the two years which are contrasted, and not the question of the use or disuse of antiseptics.

The authors, in addition to mentioning the total cases, refer

especially to five groups, and these show very interesting results. Taking the 1908 statistics, the class of cases in which the best results are noted was apparently operations for quiescent appendicitis where the percentage of septic cases is only 3·3 per cent. This agrees with what we are now thoroughly familiar—namely, that the peritoneum has a power of dealing with bacteria which may come in contact with it in a way which is not equalled by any other tissue of the body. The opposite extreme is given by the operations on the breast, where the percentage of septic cases reaches the large amount of 12·2. This result is exactly what I should have expected. Operations for cancer of the breast are extensive operations, and take a very considerable amount of time, and thus on the one hand ample opportunity is afforded for infection of the wound where no sterilization of instruments or hands, &c., takes place during the course of the operation, while the tissues which are dealt with have not nearly the efficacy as bactericidal agents which the peritoneum has.

I think that Mr. Pendlebury and Mr. Back are to be congratulated on the very careful way in which they have gone into the hospital records and on the very fair way in which they have stated the results which have been obtained. In my opinion, however, if these are the best results that can be got by the recent aseptic methods the sooner they are abandoned and their place taken by a line of treatment in which the main attention is paid to the bacteriological problem the better for the well-being of the patient and the ease of mind of the surgeon.

I may say that the paper to which I am referring has created a great deal of interest and excitement among the junior staff (house surgeons, &c.) at King's College Hospital, and I was very much gratified to find that on their own initiative, and without any suggestion on my part, they had gone into the results which have been obtained in my wards since the beginning of 1901, and to my surprise and pleasure I have received from them complete and very carefully worked-out statistics of all the clean cases on which I have operated during that period, the results of which I have verified and shall now produce. I may say that these statistics have been put together on the same lines as the statistics at St. George's Hospital, which I consider to be the correct ones—that is to say, they are only statistics of clean cases; in other words, of cases where the surgeon had unbroken skin to start with, and where in the course of the operation he did not have to open any mucous cavity, nor did he come into contact with any focus which was the seat of septic infection. For example, intestinal resections, gastro-enterostomies, operations on the gall-bladder and bile-ducts, renal calculus, &c., are excluded, and of course all operations on the rectum, bladder, urethra, mouth, throat, abscesses, septic sinuses, &c. I am very much struck by the large proportion of these cases as contrasted with "clean" cases which occur in one's hospital work.

The numbers work out at a total of 1,028 clean cases operated on during the eight years, and of these nineteen are classed as becoming infected. It is, however, very doubtful whether several of these nineteen cases should be included as I shall mention immediately.

There is a very marked difference between our results and those obtained at St. George's Hospital. Had the results been the same as

in that hospital, instead of nineteen septic cases we should, according to their 1906 statistics, have had 140 septic cases, or according to the improved results of 1908, the numbers ought to have been seventy-four.

A most important point to be noted is the conditions under which these results were obtained. In the first place we have only one operating theatre, used by all the surgeons and for all cases, septic or otherwise, and also used for lectures. Our theatre is very much as it was built and fitted out some sixty years ago. With the exception of a tesselated floor we have none of the modern arrangements; in fact, I expect it is the worst operating theatre in any of the large London hospitals.

Another and very important point is that the after-dressing of the cases is left to the house surgeon; indeed, in most cases, if I have a very full afternoon, I leave the stitching up of the skin wound to the house surgeon while I get on with the next case. Of course, a house surgeon, however excellent, is only a beginner, and to him the precautions necessary to procure an aseptic result are not yet automatic; he has constantly to think what he is about from an aseptic point of view, and I think it is very remarkable that the number of septic cases has been so few, when we remember that the men change every six months, and that during these eight years there have been seventeen house surgeons and sets of dressers. Fortunately there is a very healthy spirit of rivalry among our house surgeons. We have three house surgeons, one for each full surgeon, and they are very strong partisans, each trying to show better results than the others. When a house surgeon takes up his appointment he sets two chief aims before him. The first is to put a larger number of cases through his wards than the others, and the second to show better results, more especially as regards asepsis. With the first aim I have no sympathy whatever. I do not see why I should be overworked simply in order that my staff may crow over the others. The second aim, on the contrary, I encourage in every way. It means that the men take their work more seriously: it develops habits of care and thoughtfulness, and it trains them to regard the aseptic treatment of wounds as a matter of paramount importance. Each faction watches the others most closely, and if suppuration, however slight, occurs in any case we very soon hear of it. I venture to think that this is a spirit which should be very carefully fostered. Without it, indeed, I could not leave the after-treatment of the wounds to the house surgeon with any degree of comfort.

I may also draw attention to one point which shows very convincingly to what an extent the asepticity of the results depends on the personal equation. The cases were given to me arranged in years, and I find that in four of these years there was one septic case each year, in two years there were three septic cases each year; in one year there were four septic cases, and in one there were five. These two years in which nine septic cases occurred, nearly half the total were consecutive years, and for a time I was puzzled to account for this large proportion of failures. It occurred to me, however, to note the dates of admission of these nine cases, and I then found that seven out of the nine occurred under the care of one house surgeon. As I had seventeen house surgeons during these eight years this leaves

twelve septic cases to be distributed among sixteen men. As a matter of fact, several house surgeons had no septic case during their term of office, some had one case, and some had two.

I do not put these results forward as an example of the best that can be obtained; in these cases much has been left to beginners, and I think they are to be congratulated on the careful way in which they have done their work. But as experience and skill increase the precautions necessary to secure an aseptic result become more or less automatic; one feels instinctively if anything is wrong, and failures become more and more only the result of accidents.

One other point is shown by these facts—viz., that the extravagant amounts which are sometimes expended on operating theatres, fittings, &c., are to a large extent unnecessary. I have no objection to a nice well-fitted operating theatre at all, but things are sometimes carried to an extreme, and the operating theatre is apt to assume an undue importance in the eyes of those using it. Our operating theatre and arrangements cannot compare for a moment with those at St. George's Hospital, and yet they get four times as much sepsis as we do.

I think that the above facts show that there is a great deal more in the treatment of wounds than simple cleanliness and the avoidance of irritation. I do not believe that a surgeon will get the best results unless he takes the view that suppuration in clean wounds is avoidable, and that the way to avoid it is to look on the treatment of a wound as a bacteriological problem, and to act accordingly.—*Lancet.*

SOUTH AUSTRALIAN "DRY BIBLE."

By Veterinary-Surgeon DESMOND.

At last the cause of that dread disease "dry bible," which is responsible for the annual loss of many thousands of pounds' worth of cattle in South Australia alone, has been officially reported to have been ascertained. The discoverer is the Government Bacteriologist (Veterinary-Surgeon Desmond), who has forwarded the appended interesting and valuable interim report on the subject to the Commissioner of Crown Lands.

In January, 1903, the South Australian Council of Agriculture decided to enquire into the occurrence of a disease of horned cattle commonly known as "dry bible," and for this purpose thousands of circular letters were forwarded to owners of live stock. About 100 replies were received from different parts of the State, and when these had been reviewed the following results were obtained, viz.: Symptoms well described, 16; cattle affected which were supplied with bone meal, salt, and sulphate of iron, 10; cattle affected on green feed, 2; wrong diagnosis, 4; illness supposed to be caused through eating poison weeds, 2; abortive particulars, 66. These replies were far from being satisfactory, and when the owners of sick animals were asked why they did not answer the circular letter the usual reply was: "It was too complicated and contained too many questions." The circular contained over forty questions, and asked for replies that were far too difficult for the average farmer to answer. In 1906

instructions were given that I should make a study of the disease, and I proceeded to Morchard, where a great number of animals were affected. While in this locality my services were asked for by the Government of Tasmania to assist the Government Veterinary Surgeon of the Island State to investigate a mysterious disease of cattle. No difficulty was experienced in proving to the Government Veterinary Surgeon and the Chief Inspector of Stock there that the disease was identical with that which caused such a large death-rate among cattle in South Australia and Victoria. While in Tasmania much laboratory work was done in order to solve the problem, and has been of great practical value in the present investigation. The cultures obtained in Tasmania are still growing in this laboratory, and are transferred every month.

In 1907 the Minister of Agriculture (Hon. L. O'Loughlin), recognizing the seriousness of the trouble in the dairying districts of this State, gave instructions that I was to make a systematic study of the disease with the object of finding out a means of prevention, and, if possible, a line of treatment for affected animals. It was then pointed out that the Minister had given explicit instructions that on no account were the weekly lectures on veterinury science at the Roseworthy Agricultural College to be put aside for any other work, and that if it were decided to have the disease investigated additional help would be required to do the routine work of the veterinary department, and deliver lectures at the Roseworthy Agricultural College and the School of Mines. Accordingly, Mr. Loxton was appointed Assistant Government Veterinary Surgeon in January, 1908. When he had mastered the multitudinous duties attached to the veterinary department, I was at liberty to devote my time to ascertaining the cause of the trouble. In March, 1909, a visit was made to Orroroo, Quorn, and Hammond. At Orroroo and Quorn the cases were scattered, but at Hammond a number of cases were found under conditions favourable for a thorough investigation. A farm, recognized as a hotbed for the disease, where a large number of cattle succumbed every year and the losses during the early months of the present year amounted to several hundred pounds, and where all kinds of horned cattle, such as bullocks, cows, steers, and heifers, were affected, was chosen as the site for studying the disease in all its phases. The farm had an abundance of feed and two wells of water. The conditions in which the cattle were kept were contrary to the general opinion that the dryness of the feed was the cause of the trouble. Opportunities were offered to study the three forms of the disease, viz., the acute form, in which death takes place in a few hours; the subacute form, in which the affected animals live many days; and the chronic form, when the animals are sick for many weeks, and from which recovery takes place in a small number of cases.

The symptoms of this disease have been so often described that owners have no difficulty in recognizing it when their cattle are affected. The following additional particulars were noted on close observation of sick animals: (1) In the acute stage the affected animals are easily excited and show well-marked brain symptoms, the pulse and respiration are increased, while the temperature is about normal. Unconsciousness occurs at short intervals, and the animal falls to the ground, lying with its nose to the flank, death taking place in from a

few hours to one or two days. Such cases, when submitted to a careful *post-mortem* examination, show well-marked congestion of the delicate membrane covering the brain, and other symptoms which will be described in a future report. (2) In the subacute stage, besides the usual symptoms, such as the glassy eye, &c., there is a spasmodic jerking of the muscles of the fore part of the body and a continuous movement of the muscles above the eyes. (3) The chronic stage is most complex, and the deductions to account for the frequent unconsciousness must be postponed until a more definite investigation is made. Animals in this stage will partake of food and water, and perform all natural functions, remaining in a recumbent position for many weeks, until they are a mass of sores where their bodies come in contact with the ground, often causing the owner to destroy them to end their suffering, and to dispense with the cost of feeding and watering. There are a few cases recorded by observant owners in which an affected animal has recovered from the disease, but has succumbed to a fresh attack in the following year. In the numerous cases that have been recorded only one case is known where an animal has survived a second attack. One important feature was observed during the present year. Stiffening of the muscles (*rigor mortis*) and decomposition, even when exposed to the fierce rays of the sun in summer, is not rapid. A disagreeable, fœtid smell is given off from the carcase of an animal when submitted to a *post-mortem* examination a few moments after death takes place, or in animals that have been slaughtered for investigation purposes. Subsequent work in the laboratory decided what was the cause of this disagreeable odour. Cultures were made from all *post-mortem* examinations of animals slaughtered in different stages of the disease, and from those that had recently died. Tubes of media were inoculated with smears from the different organs and glands. The difficulties of performing field bacteriology were overcome by a simple contrivance, and satisfactory results were obtained. The weather was exceedingly warm, and an incubator for the development of any germs which were located in the tissues was not required. The majority of the inoculated tubes showed an abundant growth of various conditions and colours. These have formed the subject of extensive laboratory research.

While at Hammond I was ably assisted in carrying out the inoculation experiments by Mr. Loxton, who worked day and night in Adelaide preparing the necessary medium for the cultures. After spending three weeks in the North, it was decided to visit Adelaide for the purpose of submitting the large amount of material which had been collected to a searching laboratory investigation, the result of which was that three unusual micro-organisms were isolated and obtained in pure cultures. The next step was to inoculate animals with these cultures for the purpose of finding out if they would produce a disease, known or otherwise. The organisms were numbered 1, 2, and 3. No. 1 in a pure form was injected in large doses into two cows, and had not the slightest effect on their health, nor did it disturb them in any way. Culture No. 2 was next experimented with, and, although it did not kill the animals which were inoculated, it made them sick, and put them off their food for several days. It was resolved to inject cultures Nos. 1 and 2 mixed together. No fatal results were obtained, and the symptoms produced were identical

with those obtained when No. 2 culture was the subject of inoculation. No. 3 culture, a most difficult organism to work out in its many phases, was last experimented with, and produced quite definite results. Several cows were inoculated with it, and the following is a *résumé* of its action :—

A few moments after injection into a healthy cow there is a shivering fit, and the animal falls to the ground, the respirations are hurried, and the animal is very distressed. This, in the majority of cases, lasts only a few moments, and the animal then rises to its feet and presents the following symptoms: Pulse, respirations, and temperature much accelerated, trembling of the fore-quarters, twitching of the muscles above the eye, and a glassy appearance of the eyes. Death may take place in from nine to ten hours, and in other cases a fatal issue is not obtained until after several days. All the experimental animals were submitted to a most searching *post-mortem* examination, and all the lesions found in cattle which acquire the disease in a state of nature were present. Several sheep have been killed with this micro-organism, death taking place in about four hours. Although such a fatal organism to ruminants, the small laboratory animals—the rabbit and guinea-pig—do not succumb to experiments. This germ has already been submitted to a searching investigation, it has been repeatedly cultivated from the tissues of the various animals killed by inoculation, and when again injected into healthy cows has caused death under identical conditions. The rules which are laid down and which govern bacteriological research are termed the "postulates" of Professor Koch, and require that a micro-organism, to be recognized as a specific agent in the production of pathological alterations (diseased conditions), should fulfil four conditions: "(1) The micro-organism must be found in the blood, lymph, or diseased tissues of man or animals suffering from or dead of the disease. (2) The micro-organism must be isolated from the blood, lymph, or tissues, and cultivated in suitable media, *i.e.*, outside the animal body. These pure cultivations must be carried on through successive generations of the organism. (3) A pure culture thus obtained must, when introduced into the body of a healthy animal, produce the disease in question. (4) Lastly, in the inoculated animal the same micro-organism must be again found." All these conditions, which are in many cases not possible to put into practice when investigating diseases peculiar to the human subject, have been repeated many times in the case of the micro-organisms isolated in the prosecution of this inquiry.

An important observation was noted in the North during the month of March, and is worthy of being recorded. At a large dairy farm on which a large number of cows were milked this disease appeared for the first time, and naturally the owner was alarmed. There could be no mistake as to the disease being the so-called "dry bible," and I destroyed the affected animals and submitted them to a searching *post-mortem* examination. On viewing the conditions in which the cattle were kept it was discovered that the water supply was collected by blocking up a road on which there was much traffic, and turning the water into a large water-hole. It was decided to treat the water supply with a liberal amount of sulphate of copper; this was done under my supervision, with the

satisfactory result that no more cases occurred on the farm. In the laboratory the following experiment was made: A quantity of water from the Adelaide supply, after passing through a sterile pressure filter, was collected in a sterile flask, and submitted to further sterilization for an hour by steam pressure at 15 lb., at a temperature of 250° F. This water was inoculated with a pure culture of the micro-organism which had killed the numerous cows inoculated with it, and placed in the incubator. A ready growth under these conditions was obtained.

During September a short visit was again made to Hammond, not for the purpose of seeing cattle affected with the disease, as the majority of cases occur in the autumn months, but to conduct inoculation experiments on animals kept in a locality where the disease appears every year. Five cows were secured, two were inoculated, while the remainder were brought on to Adelaide for further experiments. The two cows inoculated showed well-marked symptoms of the disease, and one succumbed after five days. The other, a large, strong cow, although ill for seven days, survived the experiment, and it was decided to leave her in the locality for the purpose of observing future developments. A large number of farmers were interested in the experiments, and all were unanimous in declaring that the symptoms, as shown in the incubated animals, were identical with "dry bible." The owner of the farm on which there was such a large death-rate last autumn was present at the *post-mortem* examination on the cow killed by the inoculation, and he remarked: "I have removed the hides from scores of cattle which have died of "dry bible," and cut up the carcases for burial or burning, and the appearance of this cow after the experiment and the condition of the internal organs are the same as the cattle affected on my farm."

In the *Journal of Agriculture* for August the following figures relating to "dry bible" are quoted from statistics furnished by the Government Statist: "In 1907 there were were 47,480 deaths from 'dry bible;' during 1908 there were 11,133 deaths of cattle, both within and outside counties, 'dry bible' being responsible for more than one-fifth of the number—namely, 2,395." The losses to this State are enormous, as the value of the animals can be computed to be between £4 and £5 a head. These figures are quoted in this report to show how necessary it is to spare no expense to solve, if possible, a means of prevention, whereby animals in localities where "dry bible" is prevalent can be prevented from being affected with this fatal disease. Such a step would be an important one in the interests of the economics of the State. I expect to elucidate many important additional features in the laboratory investigation now proceeding, which is of a severely searching nature, embracing all phases of the question, and which is necessary to verify those conclusions forced upon me so far by the definite reaction of those organisms isolated, and which I believe are the proximate cause of "dry bible." The details of this research with all data will form the subject of my report, which will be presented at the earliest possible date, and which must be withheld until complete verification enables me to reassure the public and to face the relentless inquiry of the scientific world.

(*The Register, Adelaide.*)

TESTS CONCERNING TUBERCLE BACILLI IN THE CIRCULATING BLOOD.

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In a paper dealing with the occurrence of tubercle bacilli in the circulating blood, read before a medical society some months since and soon afterwards published in a medical journal,[1] there were recorded the results of microscopic examinations of the blood of 125 tuberculous individuals, some of whom were affected with only incipient tuberculosis, and the statement was made that tubercle bacilli were found in the blood of every one of them. In some cases only a few bacilli were seen, but "they were mostly in large numbers, and clumps of thirty to forty bacilli were not unusual, especially in cases of acute miliary tuberculosis." From his observations the author of that paper formulated the conclusion: "It appears that tuberculosis in all its forms is a bacteriæmia."

That tubercle bacilli occasionally float in the blood stream is hardly open to question, because of the occurrence of isolated lesions in the bodies of otherwise tuberculous as well as otherwise healthy individuals located in regions remote from the various channels that communicate with the exterior. The same is true when we consider cases of more or less generalized tuberculosis with many lesions in widely separated portions of the body, and cases of miliary tuberculosis with innumerable lesions of approximately, if not precisely, the same age and stage of development. But such occasional presence of tubercle bacilli in the circulating blood is a very different condition from their constant occurrence in it in sufficient numbers to justify the classification of tuberculosis as a bacteriæmia. Hence, Rosenberger's conclusion was received with considerable surprise and doubt.

Although the conclusion seemed sufficiently incredible because of the simple fact that a constant occurrence of tubercle bacilli in the blood of all tuberculous individuals could hardly have been overlooked by the host of investigators who have studied tuberculosis with no greatly different technique than Rosenberger used, we did not feel warranted in opposing it without offering some specific evidence. Because of the important bearing of the matter on the tuberculosis problem, the experiments hereinafter reported were carried out.

Rosenberger stated that he found tubercle bacilli on microscopic examination in the blood of every one of the 125 cases of tuberculosis he studied, notwithstanding that some of the cases were incipient and failed to show tubercle bacilli in the sputum. It was, therefore, almost taken for granted that the microscopic examination of blood, according to his method, of animals affected with advanced and long-standing tuberculosis, and animals that were expelling tubercle bacilli from their bodies in large numbers, would reveal at least a few tubercle bacilli. A considerable number of such microscopic examinations were made, but not a tubercle bacillus was found in our blood preparations, and hence we have to record wholly negative results with the blood of

[1] Rosenberger, Randle C., "The Presence of Tubercle Bacilli in the Circulating Blood in Tuberculosis." (Read before the Pathological Society of Philadelphia, December 10, 1908.) *American Journal of the Medical Sciences*, vol. cxxxvii., No. 2, pp. 267-269. Philadelphia and New York, February, 1909.

tuberculous animals. Similar negative results were obtained with the blood of tuberculous persons in two large New York hospitals.

It is not uncommon for virulent tubercle bacilli to be present in animal substances in numbers too small to serve for their detection by optical methods. For example, at the Experiment Station we found the intra-abdominal injection of guinea-pigs with suspected milk to be a test for tubercle bacilli that has fully fifty times the delicacy of a microscopic examination. Furthermore, tinctoral and optical methods of distinguishing between tubercle bacilli and other acid-fast bacteria are not wholly satisfactory; hence we concluded to inject a sufficient number of guinea-pigs with blood from a sufficient number of certainly tuberculous cattle to show conclusively that tubercle bacilli either are or are not commonly present in such blood.

Incidentally, it appears that Dr. Rosenberger failed to confirm adequately by animal experiments his surprising microscopic observations, which, if correct, would have been of the greatest value alone for the early and certain diagnosis of tuberculosis. In all, he inoculated only two guinea-pigs, of which he gives a record; one with blood from a tuberculous person who was expelling tubercle bacilli *per rectum*, and one with blood from a case of acute miliary tuberculosis. The development of tuberculosis in the latter guinea-pig cannot be regarded as a remarkable phenomenon. There is nothing about the fact that a guinea-pig contracted tuberculosis after an injection of blood obtained from a case of acute miliary tuberculosis that necessitates a modification of our currently accepted views on the presence of tubercle bacilli in the circulating blood. That is to say, we need not look upon tuberculosis as a bacteriæmia because tubercle bacilli were demonstrated in the blood of a kind in which we have long considered that they might sometimes occur.

This leaves one guinea-pig that may have some evidential value, but we must not lose sight of the fact that it was injected with blood obtained from a person who was expelling tubercle bacilli from his body and hence to some extent infecting his environment. We must also bear in mind that guinea-pigs are highly susceptible to tubercle bacilli injected into their bodies, and that it is often impossible for an investigator who handles much tuberculous material, who is in frequent contact with tuberculous persons, and whose environment may be characterized as containing tubercle bacilli, to eliminate all danger of extraneous tuberculous infection sufficiently to make a test satisfactory when he seeks to verify the tuberculous character of some material from a tuberculous individual by the injection of one, and only one, guinea-pig.

Summary of Present Tests.

Our own tests were made entirely with the blood of tuberculous cattle. In every case the blood was drawn from the jugular vein of the tuberculous animal and injected in its fresh, naturally warm state into the peritoneal cavity of a guinea-pig. The tuberculous cattle may be divided into four distinct lots, according to their tuberculous condition:—

(1) Four cattle, the precise tuberculous condition of which is known, because they were killed and examined *post mortem* shortly after blood was drawn from them for guinea-pig injections.

(2) Six cattle, known to be tuberculous because they had reacted

with tuberculin, because tubercle bacilli were found in their fæces on microscopic examination, and because their fæces were proven to be infectious by animal experiments.

(3) Nineteen cattle, known to be tuberculous because they had reacted with tuberculin and because tubercle bacilli were found in their fæces on microscopic examination.

(4) Thirteen cattle, known to be tuberculous because they had reacted with tuberculin.

We made no attempt to treat the blood used for the injections in any way, because we assumed that the best results would be obtained with it by transferring it as rapidly as possible from the tuberculous cattle to the peritoneal cavities of the guinea-pigs. It was learned from the injections that guinea-pigs tolerate a relatively large quantity of bovine blood in their peritoneal cavity. The guinea-pigs that died shortly after as the result of the blood injections (about 15 per cent. of all injected) with few exceptions showed extreme impaction and some inflammation of the large bowel, associated in several instances with invagination of the colon.

The possibility exists that the intraperitoneal injection of from 3 to 5 c.c. of fresh, warm blood from tuberculous cattle induces an immunity in guinea-pigs to the tubercle bacilli the blood may contain. Though this view is purely hypothetical and we know of nothing to sustain it, we have carried out an investigation to prove or disprove it, and will give the results later in this paper.

The total number of cattle from which blood injections were made was forty-two, and these, as their records show, represent a considerable variety relative to the severity and extent of the tuberculous disease with which they were affected. They ranged from animals that would not have been suspected to be diseased without a tuberculin test to a cow so badly affected that a calf of which she became the mother a little less than a year before her blood was used for guinea-pig injections was born affected with tuberculosis contracted from *ante-partum* exposure to her tuberculous body.

The total number of guinea-pigs injected was 104. Of these, sixteen died within a few days after the injection and no doubt as a result of it. Three died of intercurrent affections, but not until a sufficient period of time had passed for lesions of tuberculosis to become clearly manifest. The remaining eighty-five lived until they were killed after a lapse of from seven and one-half to eleven weeks, or an average for all of seventy days after they were injected. The three guinea-pigs that died of intercurrent affections showed no lesions of tuberculosis on *post-mortem* examination, and eighty-four of the eighty-five guinea-pigs that lived until they were killed showed no lesions of any kind on autopsy. One guinea-pig of the eighty-five showed lesions very slightly resembling tuberculosis, but these were proved by microscopic examinations and guinea-pig inoculation tests to be free from tubercle bacilli.

Discussion of Results.

Among the forty-two cattle, twenty-seven, or 64¼ per cent., were shown by microscopic examinations to be discharging tubercle bacilli from their bowels—in most instances intermittently—and the infectious character of the fæces in seven cases, or 16⅔ per cent., was

demonstrated by animal experiments—that is, feeding and inoculation tests.

These two facts—that twenty-seven of the cattle were shown by microscopic tests to be expelling tubercle bacilli *per rectum*, while only seven were proved by animal experiments to be passing infected fæces—must not be taken as being in any sense contradictory, as the fæces of only a sufficient number of tuberculous cattle were tested by animal feeding and inoculation experiments to prove conclusively that the acid-fast bacilli found on microscopic examinations in the fæces of tuberculous cattle are certainly live, virulent tubercle bacilli.

Relative to the expulsion of tubercle bacilli from the bowels of tuberculous cattle, all the evidence we have indicates that the bacilli have their origin in the lung and throat, from which regions they are coughed up, swallowed, and passed through and out of the intestinal canal without appreciable loss of pathogenic virulence. That a large proportion of the tubercle bacilli swallowed by cattle really pass through their bodies and out *per rectum* without a determinable loss of virulence was experimentally shown in some of our earlier work. We have absolutely no reason to believe that tubercle bacilli enter the intestinal canal from the lymph radicals or blood capillaries or by any complex and mysterious system of transportation from lesions of all descriptions and kinds in any or every portion of the body. It is our conviction that, unless an open tuberculosis is in more or less direct communication with the intestinal canal, or there is a tuberculous disease of the intestine itself, which latter is rare among cattle, no tubercle bacilli will be expelled with the fæces.

If tuberculosis in all its forms was a bacteriæmia the expulsion of tubercle bacilli from the bowels of all tuberculous individuals, as well as with their urine, saliva, milk, and other bodily secretions, would follow as a natural consequence. Those who have carefully studied the secretions from the uninvolved organs of tuberculous subjects know how rarely tubercle bacilli are detected in them even with the application of the most delicate tests.

When we consider cattle like Nos. 533, 549, and 552, and note that they were so badly diseased that they would have been condemned on superficial examination as wholly unfit for use as food under the existing meat inspection regulations, the absence of tubercle bacilli from their blood may be regarded as a sufficient reason for assuming that the possible occurrence of tubercle bacilli in the blood of tuberculous animals will almost invariably be associated with pathological conditions of a very marked character, or that the tubercle bacilli will be present in extremely small numbers and will speedily be filtered out of the blood stream. Cow 533 had been affected with tuberculosis two years or longer, was in poor condition as a result of the disease, and on autopsy was found to have an extensive, open tuberculosis of the lung and lesions of tuberculosis in the liver and in both the thoracic and abdominal lymph glands. Cow 549 was, if anything, even more severely and extensively affected, and had given birth to a congenitally tuberculous calf less than a year before her blood was injected into guinea-pigs. Cow 552 was also affected with a generalized, advanced, open tuberculosis, and prior to the use of her blood for the guinea-pig injections was found to be passing from her bowels large numbers of tubercle bacilli, which were proved by feeding tests

to be virulent for hogs and by inoculation tests to be virulent for guinea-pigs. With the blood obtained from these three cows fourteen guinea-pigs were injected, of which two died prematurely, and twelve lived two months or more afterwards, until they were intentionally killed, when they were found on *post-mortem* examination to be wholly free from lesions of disease of any kind.

Supplemental Tests regarding Possible Immunity.

We have already stated that the possibility exists that the intra-peritoneal injection of from 3 to 5 c.c. of fresh, warm blood from tuberculous cattle induces an immunity in guinea-pigs to the tubercle bacilli the blood may contain. Although we knew of nothing to uphold this theory, we considered it necessary to undertake an investigation to prove or disprove it, the results of which are now presented.

On April 24, 1909, blood and tuberculous material was obtained from Cow 533 for a number of guinea-pig injections. The primary object of the injections was to prove that the blood of a tuberculous cow, when introduced into the peritoneal cavity of a guinea-pig, has no retarding influence on the development of tuberculosis from tubercle bacilli that may be present in it.

Cow 533 was first bled from the jugular vein and then at once killed. As soon as she was dead a tuberculous mediastinal gland was removed from her body and 500 mg. of it emulsified with 2 c.c. of sterile, normal salt solution. Cover-glasses of this emulsion, stained with carbol-fuchsin and decolorized with 20 per cent. sulphuric acid, revealed on microscopic examination, on an average, two tubercle bacilli each. The emulsion was mixed with an additional quantity of sterile, normal salt solution, so that each cubic centimetre of the dilution represented a strength equal to one drop of the original emulsion.

The blood obtained from the cow prior to her death and the diluted emulsion made with the tuberculous mediastinal gland from her body were used to inject seven groups of guinea-pigs.

The guinea-pigs in the seven different groups were injected for the following purposes: Group 1, to serve as checks on the absence or presence of tubercle bacilli in the blood of the tuberculous cow that was used for the investigation; Group 2, to show that the intra-abdominal injection of fresh, warm blood from a tuberculous cow cannot protect against tubercle bacilli simultaneously introduced into the abdominal cavity; Group 3, to show that the intra-abdominal injection of fresh, warm blood from a tuberculous cow cannot protect against tubercle bacilli introduced into other parts of the body than the abdominal cavity; Groups 4 and 5, to show that the blood of tuberculous cows has no special germicidal potency for tubercle bacilli; Groups 6 and 7, to serve as guides relative to the amount of tuberculous disease to be expected in the bodies of the guinea-pigs that were injected with both blood and emulsion of tuberculous material.

The autopsy records of the guinea-pigs show, in a general way, very little difference between the animals that received only tuberculous emulsion and those that received both blood and emulsion. The guinea-pigs that received both blood and emulsion into their abdominal cavities showed numerically more extensive lesions of tuberculosis than

the guinea-pigs that received only emulsion into their abdominal cavities. This condition would naturally be expected, because the same number of tubercle bacilli contained in 3 c.c. of blood would be more widely separated and in better condition to start a large number of individual lesions than those in 0·5 c.c. of salt solution.

The use of an emulsion of tuberculous tissue from the tuberculous cow that supplied the blood for the supplemental injections was preferred to the use of a pure culture of tubercle bacilli, because it seemed desirable to us to use infectious material and blood in this instance from the same individual case of tuberculosis.

The total number of guinea-pigs injected in this supplemental investigation was forty-eight, of which eight received blood only, thirty-two both blood and tuberculous material, and eight tuberculous material only. Of the thirty-two that received both blood and tuberculous material and the eight that received only tuberculous material, six died prematurely, and the remaining thirty-four, when they were killed—thirty to thirty-one days after the injection—were all found to be affected with tuberculosis of a form that would have progressed to death in a short time.

Among the eight guinea-pigs that received an injection of fresh, warm blood without the addition of tuberculous material, one died prematurely and the remaining seven were found on autopsy to be free from lesions of disease. Since the cow that supplied the blood for the injections was affected, as her record shows, with extensive, advanced tuberculosis, the seven guinea-pigs make a strong addition to the eighty-eight parallel cases of which the records have been previously given; and hence we have ninety-five guinea-pigs as the total number that received injections of blood from tuberculous cattle into their peritoneal cavities—the most delicate test for tubercle bacilli available —and survived the injection long enough for tuberculosis to manifest itself clearly. Among this total of ninety-five guinea-pigs not one case of tuberculosis developed.[1]

Conclusions.

(1) We failed utterly to find tubercle bacilli in the blood of tuberculous cattle which we examined microscopically in accordance with the method described and used by Dr. Rosenberger.

(2) The negative results of our microscopic examinations are confirmed by the negative results obtained with ninety-five guinea-pigs,

[1] An independent investigation relative to the occurrence of tubercle bacilli in the circulating blood of cattle was made in the Bureau of Animal Industry by Dr. John R. Mohler, Chief of the Pathological Division. Mohler examined the blood of eight cattle microscopically, and with blood from each of these cattle injected five guinea-pigs. The microscopic examinations and injections were made precisely in the manner described by Dr. Rosenberger. No tubercle bacilli were discovered microscopically, and not one of the forty injected guinea-pigs contracted tuberculosis. Two of the eight cattle were in good condition, but were passing tubercle bacilli from their bowels; two of the cattle were in poor condition and were passing tubercle bacilli from their bowels; and four of the cattle were slaughtered for meat, but on inspection were found to be so extensively affected with tuberculosis that it was necessary to condemn and tank their carcasses under the Federal meat inspection regulations. This evidence, kindly presented to us by Dr. Mohler, raises the number of tuberculous cattle from which blood was tested to fifty, and the number of guinea-pigs that received injections of blood from tuberculous cattle without contracting tuberculosis to 135.

each of which received an intra-abdominal injection of blood from a tuberculous cow or bull.

(3) As the number of cattle from which blood was injected into the ninety-five guinea-pigs was forty-two, and as these cattle represented practically all stages of tuberculosis, from mildly affected recent cases to old and completely generalized cases, we feel that our work shows beyond the remotest doubt that tuberculosis is not to be classified, in any sense of the word, as a bacteriæmia.

(*Bulletin* 116.)

THE KEEPING OF PIGS.

TASTE in the matter of pig-keeping varies a good deal in different parts of the world and, indeed, of the British Isles, and those who have wandered about the rural districts of Ireland must have felt that difficulties might arise in any very vigorous attempt to exact a very high standard in the matter. But even in Ireland common consent has accepted a different standard for urban as against purely rural districts. In England and Wales Section 47 of the Public Health Act, 1875, provides for a penalty against any person who in an urban district keeps any swine or pigsty in any dwelling-house, or so as to be a nuisance to any person, while Section 91 provides that any animal so kept as to be a nuisance or injurious to health is an offence. Although in England swine are very rarely, if ever, found actually kept in dwelling-houses, they are frequently, especially in some districts where the pork industry flourishes, kept under eminently undesirable conditions, and in this connection a correspondent refers to an instance in which premises under a carpenter's workshop have been let, and the tenant keeps pigs therein.

It is not quite clear from our correspondent's communication whether the pigs are kept in a part of the premises in actual occupation of the new tenant, or whether the tenant simply uses all the premises for the purpose of pig-keeping. In any case the stench arising from the pig-keeping is so great that the carpenter cannot persue his calling, and our correspondent asks whether the odour is injurious to health. It seems to us that the case is one, whether in an urban or rural district, in which the local medical officer of health and sanitary inspector ought to be able to afford the carpenter relief, and if by any chance the circumstances were such that the Public Health Act would not touch this case, possibly the carpenter might obtain redress at common law. In many places by-laws have been sanctioned relative to the minimum distance from dwellings at which pigs may be kept, and we believe that a distance of 100 ft. has been allowed in some instances. The pig is the victim of what Dr. Ballard, in his classic writings on offensive trades and the like, regards as a mistaken popular prejudice, and this prejudice militates against any trouble being taken to keep pigs in a cleanly state. In Ballard's view the pig is naturally a clean, not a dirty animal, and his wallowing in the mire has for its object cutaneous cleansing, the mud standing to the pig in relation to soap to the human being, this mud when dry caking and falling off and carrying with it the hairs and cutaneous *débris* which irritate him.

Similarly Ballard is found in defence of the good habits of the pig. The animal, according to him, does not habitually prefer disgusting food. In the wild state the pig does not eat garbage, but acorns, roots, and fallen fruits. It is said, too, that pigs which are provided with outdoor runs will never foul their beds, and that on very large pig runs, where pigs are provided with shelters for the night, a pig fouling the common bed is very severely handled by his fellows. There can certainly be no question that pigs may easily be kept in a cleanly state in properly constructed sties, and the more modern by-laws in reference to pig-keeping have relation more to the method of keeping the pigs than to the position of the sties. Experience shows that pigs kept in a thoroughly cleanly state thrive better than when in filth, and the nuisance relating to pig-keeping may by the exercise of moderate care be reduced to very small dimensions.

(*Lancet.*)

THE SECOND INTERNATIONAL FOOD CONGRESS.

By LOUDON M. DOUGLAS.

Edinburgh.

THE First International Food Congress was held at Geneva, under the auspices of the White Cross Society of Geneva, and the results attained there were of such a highly satisfactory character as to warrant the promoters in looking forward to an even more successful Congress during the present year. It was determined to hold the second Congress in Paris, and so continue the good work so well begun. At Geneva pure food in all its branches was defined, as also alimentary substances such as drugs and ice. This Congress was devoted to the definitions of such operations as might be recognized in the manufacture of alimentary substances. In passing, it may be said, that when these definitions are complete they will form a guide of an irreproachable character to all who are concerned in the production or handling of food and alimentary substances. It will not be possible, however, to translate into law the various findings until analytical methods are unified and a complete system of standardization has been set up in every country. Next year's Congress will most likely be devoted to this work, and, to judge from the numbers attending at Paris, there is every likelihood that, wherever it is held, it will attract enthusiastic food specialists from all parts of the world.

The Paris Congress was an undoubted success. It was held in the College of Medicine, Paris, which was kindly given up by the Faculty to its deliberations during the week, October 17 to 24 inclusive, and, although the halls are fairly large, they were crowded on many occasions when burning questions were being discussed. Over 2,000 members subscribed their names, and they hailed from twenty-eight different countries throughout the world, and such a large number taxed the secretarial staff to the utmost. Orderly arrangements, however, came out of it all, and, as promised, the official opening duly took place on Monday, October 18, and was presided

over by M. Ruau, the distinguished Minister of Agriculture of France, who was supported by Professor Bordas, President of the Congress.

The method of carrying on the Congress was very effective, the various food and alimentary substances being grouped together under a general heading, which formed the designations of Sections, and the order of procedure was as follows: Each subject was discussed and a definition arrived at by a vote. This definition, or resolution, was considered to be the finding of the Section, and was thereafter referred to the Hygienic Section, which discussed the matter from the point of view of health and hygiene.

This arrangement worked very well, and it is gratifying to say that in the Hygienic Section alone there were frequently over 500 interested people present, which shows that there was an amount of enthusiasm one would hardly have expected to find in connection with such a subject as the food supply.

The Sections were as follows: (1) Drinks, including wine, liquers, cider, beer, syrups, and vinegar. (2) Bakery products, including flour, bread, and pastry. (3) Confectionery, including sugar, honey, cocoa, and chocolate. (4) Grocery and spices, including tea, coffee, mustard, and salt. (5) Dairy produce, including milk, cream, condensed milk, butter, cheese, and eggs. (6) Meat industry, as also oils, edible fats, bacon curing, sausages, preserved fruits, and vegetables. (7) Drugs, essential oils, chemical products, mineral waters, and ice.

In all these Sections there were continuous discussions until resolutions were arrived at, and the results will be published in proceedings (*compte-rendu*) in due course, and this will form a complete book of reference on the sophistications of food and the limits to which such will be tolerated in all countries.

One of the most important discussions took place concerning dairy produce and the use of preservative in butter and other produce. It was decreed that "boron preservatives" were not only allowable, but were absolutely necessary in the manufacture of butter. It was also held that the addition of such a preservative should not require to be declared in future any more than the presence of salt would require to be declared, and thus the addition of preservative would be reduced to the regular operations recognized as being essential to the good conduct of the butter industry. It was also decreed that the standard water contents of butter should be raised from 16 to 18 per cent.

Milk, again, was considered to be only worthy of the name when derived from a healthy cow, and could only be regarded as pure when it did not contain any colostrum or any added matter whatever. The subtraction also of any portion of the fat was regarded as being an irregular operation. Pasteurization, filtration, and refrigeration were regarded as regular operations; but sterilization, creaming, and homogenization were declared to be facultative operations which should be announced at time of sale.

In the department of charcuterie an interesting discussion took place on the constitution of sausages, and it was finally determined that when the ingredients added to the sausages contained more moisture than the principal ingredient, the excess should be declared —that means that if bread or any similar farinaceous substance should be added to the sausages, and it contains more moisture than the meat, this would be looked upon as an added ingredient, and the

sausage should only be sold after the excess of moisture had been declared.

In connection with drugs much discussion took place, and a very interesting *brochure* was presented by the English delegation, and occupied a large part of the discussions. The result may be the appointment of an International Commission to more fully investigate the matter.

These brief references to the decisions arrived at will serve to indicate the kind of work done, and will also illustrate the fact that the various discussions were taken part in by men who were thoroughly competent to come to a decision on the various matters submitted to them.

One thing was very noticeable, namely, that it became plainer and plainer as the Congress progressed that there was hardly a substance in connection with the food supply which was not subjected to some kind of sophistication or adulteration, and it became evident also that if the means could be devised to prevent frauds in food it would be an immense gain to every nation, inasmuch as it appeared to be quite common in some industries to employ skilled chemists with a view to reducing the quality of the food, while preserving their external appearance, and that frauds of this kind are daily perpetrated. This more especially affects the poor, who are not in a position to judge of the purity of their food or control it in any way.

The City of Paris gave a reception, as did also the Minister of Commerce, and amongst the private hosts who generously entertained many visitors were Madame and Monsieur Paul Bolo, both of whom have shown from the beginning an enthusiastic interest in the work of the White Cross Society of Geneva. It is largely due to their generosity that the Society came into existence and has been able to accomplish so much good work.

This year's Congress will be held at either London, Rome, or Brussels; but it has not so far been determined which of these three cities will be selected.

Review.

THE REGISTER OF VETERINARY SURGEONS, 1910. Published according to Act of Parliament. Printed by H. and W. Brown, London, and published at The Royal College of Veterinary Surgeons, 10, Red Lion Square, Holborn, W.C. Over 400 pp. Price 3s. 6d. post free.

We have received a copy of the "Register of Veterinary Surgeons" revised to January 1, 1910. Last year we were pleased to note a number of improvements on previous issues, and we are now pleased to note a number of further improvements. There is now included a list of the members of the various standing Committees of the Council, and also a list of important dates of the year, such as dates of Council meetings and examinations. From the latter list we gather that the foreign voting papers were issued on February 1; that May 11 is the last day for nominations to Council; that May 18 is the day fixed for the issuing of the general voting papers, which must be returned not

later than May 25. In addition to a list of the members of the Army Veterinary Service, there is now a list of the Territorial Veterinary Service, which numbers almost 100 members. Appendix ix. consists of the Diseases of Animals Act, 1909.

It is interesting to note that the total number of Members of the Royal College of Veterinary Surgeons is now 3,372, being an increase of thirteen over last year's number. Two hundred and eighty-four Members are also holders of the Fellowship diploma. The registered practitioners now number 269, a decrease of eleven for the year.

The addresses of several members are noticed as missing. Such members should at once communicate with the Registrar (Mr. F. Bullock), in order to prevent their names being removed from the Register under the operation of Section 5 (4) of the Veterinary Surgeons Act. We congratulate the Registrar on the continued improvement in the usefulness of the Register.

Miscellaneous.

ORDER OF THE BOARD OF AGRICULTURE AND FISHERIES.

(Dated February 8, 1910.)

Animals (Notification of Disease) Order of 1910.

The Board of Agriculture and Fisheries, by virtue and in exercise of the powers vested in them under the Diseases of Animals Acts, 1894 to 1909, and of every other power enabling them in this behalf, do order, and it is hereby ordered, as follows :—

Application of Order.

(1) The diseases to which this Order applies are cattle plague, contagious pleuro-pneumonia of cattle, foot-and-mouth disease, sheep-pox, sheep-scab, swine fever, anthrax, epizootic lymphangitis, rabies, glanders and fascy, and the definitions of "disease" and "diseased" in the Diseases of Animal Act, 1894, are extended for the purposes of this Order accordingly.

Notification of Disease.

(2) (*a*) A veterinary surgeon or veterinary practitioner who in his private practice is employed to examine any head of cattle, or any sheep, goat, swine, horse, ass, or mule, or the carcase of any such animal, and is of opinion that the animal is diseased, or was diseased when it died or was slaughtered, or suspects the existence of disease therein, shall with all practicable speed give notice of the existence or suspected existence of disease to an inspector of the Local Authority, and also, except where the disease is anthrax, sheep-scab, glanders or farcy, to a constable of the police force for the police area in which the animal or carcase is, who shall transmit the information to the Board of Agriculture and Fisheries by telegram addressed "Agrifi London."

(*b*) An Inspector of the Local Authority on receipt of notice under this Order shall forthwith report the existence or suspected existence of disease to the Local Authority, and, if the disease is anthrax, glanders or farcy, also to the Medical Officer of Health of the Sanitary District in which the animal or carcase is.

(*c*) The notification of disease hereby prescribed shall be in addition to any notification prescribed by any other Order relating to the disease.

Communication of Information of Disease by one Local Authority to another.

(3) Where a Local Authority receives under this Order or otherwise information of the existence or suspected existence of disease in relation to a carcase of an animal that has died or been slaughtered in the District of another Local Authority, the Local Authority shall forthwith transmit the information to the other Local Authority.

Fee for Notification.

(4) (*a*) A veterinary surgeon or veterinary practitioner who under and in accordance with this Order gives notice of the existence or suspected existence of disease to an Inspector of the Local Authority shall be entitled to receive from the Local Authority a fee of two shillings and sixpence for each notification.

(*b*) Where two or more animals or carcases are examined by a veterinary surgeon or veterinary practitioner on the same premises and at the same time and are found to be diseased, or are suspected of being diseased, one fee only shall be payable to him in respect of the notification of the existence or suspected existence of disease in such animals or carcases.

Commencement.

(5) This Order shall come into operation on the first day of April, nineteen hundred and ten.

Short Title.

(6) This Order may be cited as the "Animals (Notification of Disease) Order of 1910."

In witness thereof the Board of Agriculture and Fisheries have hereunto set their Official Seal this eighth day of February, nineteen hundred and ten.

T. H. Elliott,
Secretary.

Translations.

HYPERTROPHIC CIRRHOSIS OF THE LIVER AND BILIARY LITHIASIS.

By M. E. HONDEMER.

Veterinary Surgeon to the Mounted Batteries of the Algiers Division at Hussein-Dey.

On May 1, 1907, the mare Sagesse, aged 9, is brought to the infirmary with colic. She is not long in showing vertiginous trouble; she pushes violently agaiust the wall and grinds her teeth; the lips move convulsively; the body is covered with sweat.

These signs of excitement recur, interrupted by periods of relative calm. The above symptoms are co-existent with chronic intestinal indigestion: dull pains, absence of borborygmus, defæcation, and meteorism, cause one to diagnose abdominal vertigo.

Treatment varies. Bleeding, refrigeration of the brain, injections of pilocarpine, ammoniacal drinks, glycerinated injections, purgatives, puncture of the cæcum, &c., are used against the affection. But up to May 11, date of death, no betterment occurs; weakness becomes accentuated, and the invalid dies comatose.

Autopsy.—After ablation of the intestinal mass the liver appears bound to the duodenum by a bile-duct, whose diameter is larger than that of the small intestine. One feels inside this conduit a rounded, hard body, a little less in size than a fist. Its incision gives issue to a flood of brownish bile, thick and viscid, holding in suspension veritable gravel.

The obstruction and distension of this canal are due to a voluminous calculus of greenish, orange and brown tint, having the considerable weight of 230 grammes. The liver is affected with hypertrophic cirrhosis. Isolated, it weighs 15 kilogrammes (about 33 lb.). It resists pressure; its parenchyma, decolorized, grates when incised. On section one distinguishes brownish points (deformed hepatic lobules) surrounded by a whitish zone of fibrous aspect (hyperplased perilobular conjunctive tissue).

Incising the ducts of the different lobes of the liver, one sees them considerably dilated, stuffed with numerous concretions, varying in shape and size from that of a grain of sand to a pigeon's egg. All these concretions are made up of concentric layers of biliary salts. This autopsy, interesting from the point of view of the lesions, seems to show (1) that biliary lithiasis, even when pronounced, can co-exist with a state of apparent health (a fact noted by Leclainche in "Précis de pathologie interne," "*Maladies interne du cheval*"); (2) that diagnosis affections of the liver in solipeds is difficult.

The existence of hepatic calculi is ordinarily interpreted by periodic colic, having the character of intestinal indigestion and accompanying icterus.

The mare Sagesse had shown at different times symptoms of intestinal indigestion; but the yellowish tint of the apparent mucosa had never been sufficiently pronounced to make one think about liver trouble. A very profound clinical examination would alone make one suspect the cause of the dizziness. Percussion would have revealed an area of dulness behind the right hypochondria. Palpation might

have given useful information by reason of the very distinct hypertrophy of the hepatic mass.

Examination of the fæces has not been practised; defæcation was suspended. In case of normal evacuations excretions should have presented the following characters: Decoloration, stearated appearance; putrid odour.

Analysis of the urine would have been a very valuable procedure. One would have almost certainly obtained Gmelin's reaction.

These different researches have, unfortunately, not been practised, fascinated as one was by the dominant symptoms of intestinal indigestion and vertigo. An exact diagnosis would certainly not have saved the invalid; but it would have satisfied her medical attendant.

(*Revue Générale de Médecine Vétérinaire.*)

BIER'S THERAPEUTIC METHOD.

By LEMIRE and DUCROTOY.

THE authors trace the history of Bier's method from the experiments of Ambrose Paré up to the time of the publication of Bier's work, "Hyperæmia as a Curative Means."

The principal ways in which the hyperæmia acts is by an analgesic, bactericidal, resorptive, resolutive, nutritive and regenerating effect. The method of obtaining *active hyperæmia* by heating boxes is hardly applicable to veterinary practice, where the old vesicants and rubefacients are retained. But it is in *passive hyperæmia* that the authors proclaim the most interesting developments. They study the technique of elastic bandages and of cupping glasses, and arrive at the following conclusions:—

(1) *Elastic bandages* can only be applied usefully on terminal regions, and one can only think of treating by them affections situated on the inferior parts of the limbs, below the hocks and knees, or at the head.

They can give excellent results; but appreciation of them fails to measure the degree of compression. Their use easily exposes the skin to sloughing, and to sum up the method, is a personal one, and is susceptible of giving very different results in the hands of diverse operators.

(2) *Cupping*[1] is a simple means which does not require special apparatus, and for which a glass suffices, with a little wadding or other inflammable material to rarify the air at the time of application.

MM. Lemire and Ducrotoy demonstrate the good foundation of their conclusions from fifty-eight personal clinical observations made up as follows:—

[1] To the part to be operated on, a flannel or sponge soaked in hot water is applied in order to bring blood to the part, a cupping glass is then put on, into which some inflammable material, *e.g.*, a piece of paper soaked in spirits of wine has been placed. Place one edge of the glass on the skin, ignite the spirit, and press the glass down; it will adhere by suction. Fix two or three glasses this way, and to the centre of each swelling of the skin they raise apply a scarifier, operating rapidly, then re-apply the glasses, and they will fill with blood to the required quantity.—*Translator.*

1	phlebitis of the saphena	1 cure.
1	open arthritis of the fetlock	1 cure.
2	open arthritis of the hock	2 checks.
1	temporo-maxillary arthritis	1 cure.
7	deep injuries to the coronet	4 cures. 3 checks.
2	penetrating wounds of the plantar region... ...	2 cures.
1	cartilaginous injury	1 cure.
5	sore throats	5 cures.
2	lymphangitis of the limbs	2 checks.
2	strains of the flexors	2 checks.
7	strains of the perforatus	2 cures. 5 checks.
2	strains of the suspensory	1 cure. 2 checks.
1	strain of the fetlock joint	1 cure.
16	contused wounds	16 cures.
5	penetrating wounds	4 cures. 1 check.

They make no allusion about the many inconveniences of the method which are: (1) The impossibility of placing elastic bandages above the elbow and the stifle; (2) insufficiency and imperfection of means to enable us to judge of the quality of the stasis; (3) difficulty of obtaining immobility in animals; (4) constant supervision of the invalids; (5) the objections they can evince; (6) sloughing and local atrophy resulting from compression a little too strong and prolonged.

(*Revue Générale de Médecine Vétérinaire.*)

Books and Periodicals, &c., Received.

Register of Veterinary Surgeons; Transvaal Agricultural Journal; Bulletins of the Bureau of Animal Industry; Bulletins of the Sleeping Sickness Bureau; Rhodesian Agricultural Journal; Proceedings of the Royal Society of Medicine.

Letters and Communications, &c.

Mr. E. Wallis Hoare; Mr. J. Bickford; Capt. Knott; Mr. Trotter; Mr. Rutherford; Professor C. H. F. Nuttall; Mr. D. Forwell; Mr. R. Waghorne; Department of Agriculture and Technical Education for Ireland; Board of Agriculture and Fisheries; Registrar of the Royal College of Veterinary Surgeons.

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

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Illustrations for reproduction should be in good black or dark brown on white paper or card.

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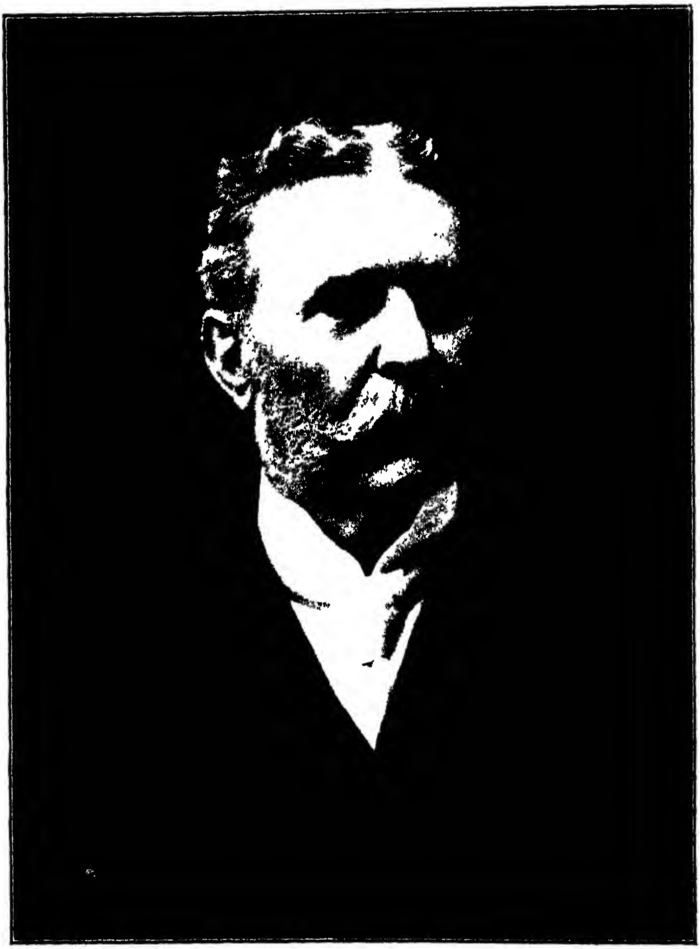

THE LATE SAMUEL LOCKE, M.R.C.V.S.

THE

VETERINARY JOURNAL

APRIL, 1910.

THE LATE PRESIDENT OF THE ROYAL COLLEGE OF VETERINARY SURGEONS,

SAMUEL LOCKE, M.R.C.V.S., 1845-1910.

ALL our readers will regret to hear of the death of the esteemed President of the Royal College of Veterinary Surgeons, which took place on March 9, at Manchester, in his sixty-fifth year. Apart from the personal loss which many of us feel, Mr. Locke will be sorely missed at the Council Meetings, where he had proved his marked ability in smoothly directing the work of our representatives under difficult circumstances. No man has ever had the welfare of his profession more at heart than Mr. Locke, who practically died "in harness," as he would have wished.

Born at Salford, Mr. Locke served a pupilage with the late Mr. John Lawson, and, proceeding to the Glasgow Veterinary College, he took his diploma in 1869. For many years he was a member of the Lancashire Veterinary Medical Association, of which Society he officiated at different times as President and Secretary, while for nearly twenty years, right up to the time of his death, he acted as Secretary of the National Veterinary Benevolent and Mutual Defence Society. He became a member of the Council of the Royal College of Veterinary Surgeons in

1895, and was a Vice-President in 1900, 1904, 1906, and 1908. Last year he attained the highest honour his profession could bestow upon him and was elected President. During his term of office his exercise of great tact and business capabilities more than justified the confidence reposed in him, and it is a great loss to the profession at large that he has not been spared to complete his term of office.

In addition to the duties involved by a busy practice and his various labours on behalf of his profession, Mr. Locke was able to find time for much public work. He was a prominent member of the Manchester City Council, and was for many years an overseer for South Manchester. It was largely due to his efforts that the excellent system of meat inspection conducted by properly qualified veterinary officials was introduced. He was a trustee of the Manchester Royal Infirmary, and Vice-Chairman of the Manchester Adult Deaf and Dumb Institute. Mr. Locke was also a prominent Freemason, being particularly interested in the Masonic charities. He was a Past Master of the Chorlton Lodge, and a Past Provincial Grand Deacon of West Lancashire.

This is the first time that a President of the Royal College of Veterinary Surgeons has died during his year of office.

Editorials.

VETERINARY EXAMINATIONS AT DOG-SHOWS.

In the course of his very excellent contribution on Distemper in this issue of the Veterinary Journal, Mr. Livesey incidentally draws attention to the question of veterinary examination of dogs at shows. Mr. Livesey says, "The present veterinary examination at dog-shows is an absolute farce." While we are not able to go to this extreme, we must admit that the examination referred to very frequently indeed leaves much to be desired. The conditions under which a veterinary surgeon has to examine dogs before they are admitted to shows render it absolutely impossible for the examination to be as perfect as it should be. It is absurd to expect any man, no matter how expert he may be, to examine the number of dogs he usually is expected to examine in the time allotted for the purpose. It is usually only dogs in the early stages of the disease, or in the convalescent and still infective stage, that are likely to be overlooked; and these are cases in which a diagnosis is often extremely difficult, especially when the owner is aware of the state of affairs, and does all in his power to hoodwink the examiner. It is a curious trait in the character of a number of dog-breeders who, while complaining bitterly of the risks of infection at dog-shows, do not act as squarely as they should do themselves. How frequently we find doggy people wiping the eyes of their dogs before the veterinary surgeon can see them in order to avoid the possibility of a catarrh being diagnosed as distemper. Veterinary surgeons know quite well that a conjunctival discharge may be due to many other causes than distemper. On the other hand, if the case should be one of distemper, surely it would be better for all concerned that the dog should be sent home—better for himself and his owner as well as for the other dogs present. We believe that many of the dogs that have died of distemper after shows were already infected before they were taken to the show, and if the veterinary examiner had only been assisted instead of misled by the owner, they would have been taken home and properly nursed at the most critical time and would have

recovered; and, moreover, the lives of many other valuable dogs with which they were brought into contact would have been saved also.

We admit, then, that numerous dangerously infective dogs are allowed to be exhibited at shows, and the question arises as to how it is to be prevented or minimized. We believe there is a solution to the problem, but it can only be attained by the co-operation of all concerned, viz., the organizers, the exhibitors and the veterinary surgeons. The fact that there is a veterinary examination at all prevents obvious cases of disease being brought to the show, but the less obvious ones are brought in the hope that they may be overlooked in the hurry of examination.

In the first place, then, there should be a larger number of veterinary inspectors appointed in order that a proper examination may be possible. No veterinary surgeon should examine for admission any dog belonging to one of his own clients. Exhibitors should be informed of this fact, and they should assist in examination instead of attempting to cover possible symptoms of disease. An additional veterinary surgeon should be appointed as a referee to decide on cases of dispute, and his decision should be final. In the case of smaller local shows when only one veterinary surgeon is required, he should not be the local veterinary surgeon. This would prevent local jealousies, and also guarantee an impartial decision as to the fitness of exhibits.

As to the question of payment of veterinary inspectors at shows, we are of opinion that a fee should be paid as a matter of principle. If any veterinary surgeon preferred not to be paid for his duties in this connection he could return his fee to the show funds in the form of a donation. On the other hand, the veterinary surgeon is acting as a specialist for the protection of the owners of more or less valuable animals, and his services should be adequately recognized.

DEGREE OF DOCTOR OF VETERINARY SCIENCE.

In view of the recommendation passed by the last International Veterinary Congress, it is interesting to note that the statutes of the Melbourne University provide both for the degree of Bachelor and that of Doctor in Veterinary Science. When the question as to whether the term "Veterinary Medicine" or the term "Veterinary Science" should be employed was discussed by the Faculty, it was unanimously decided that the latter being more comprehensive than the former should be recommended to the Senate, and this was approved.

The regulations state that candidates for the Degree of Bachelor "shall subsequently to their matriculation pass five examinations and complete five years"; that "Candidates for the degree of Doctors must be Bachelors of at least two year's standing in the University of Melbourne"; and that "Candidates may proceed to the degree of Doctor by examination or by presentation of a thesis."

It is also provided that Members of the Royal College of Veterinary Surgeons who have been resident in Australia or New Zealand for a period of twelve months prior to the year 1912 may, on the recommendation of the Professrial Board, be admitted to the degree of Bachelor on writing a thesis to the satisfaction of the special examiners appointed; two years later, of course, they are qualified to proceed to the degree of Doctor, either by examination or by thesis.

A further concession has been made to heads of State Veterinary departments in Australia and New Zealand, and to Veterinary Surgeons engaged in teaching at the University, by a temporary Regulation permitting them on the recommendation of the Faculty to proceed to the degrees of Bachelor and of Doctor of Veterinary Science simultaneously, by presentation of thesis. Already Messrs. S. S. Cameron, Chief Veterinary Officer of Victoria, Professor Gilruth, and Mr. W. T. Kendall, of the University, have complied with the conditions and had the degrees conferred, while Mr. Sydney Dodd, Chief Veterinary Officer of Queensland, has been notified that his thesis has been accepted, and that the degrees will be conferred in due course.

General Articles.

DISTEMPER IN DOGS.

By G. H. LIVESEY, M.R.C.V.S.
Hove.

In contributing a paper on distemper I feel sure that some notes on one's clinical experience will be probably more acceptable than a lengthy review of what has already been written, or a criticism of various writers' statements as to the cause of this terrible scourge.

Although it is so widespread and so well known, distemper is one of the diseases which is least often diagnosed in its early stages. One of the greatest difficulties in the way of successful treatment is the inability of a large number of veterinary surgeons and of the public to diagnose distemper until the disease is well established or complications have supervened. So long as distemper is unrecognised until marked nasal and conjunctival catarrh are present, so long also will the death-rate of the disease remain at its present high figure.

The general public do not know the early signs of distemper, and we may feel fairly certain that a very great number of veterinary surgeons now in practice are not much wiser. For, as proof of this, one has only to attend almost any large dog show and carefully look over the young dogs and puppies. As dogs suffering from distemper are not supposed to be received at any show we are forced to the conclusion that these cases have been unrecogized. Moreover, after every large show, and especially in damp weather, we always hear of a number of cases of distemper "which has been caught at such and such a show." At one large show in London I saw several cases. I have been told by other veterinary surgeons that many so-called doubtful cases have to be admitted by them to shows as a matter of diplomacy, for the public and breeders who pay good entry fees must not be offended, and a man must not make himself so unpopular as to risk his future appointment. It is a most difficult matter to decide quickly that a young dog has not got distemper, and it is an impossibility for one man to examine say two hundred dogs in a couple of hours and do himself and his profession justice. For this and other reasons I have now refused to act as veterinary surgeon to any show. I know some members of our profession who depend for their diagnosis upon the presence of "a fleck of matter in the corner of the eye," and a rise of temperature and depression. I feel sure that such gentlemen, if they act for shows, must pass in a lot of incipient cases. I have often seen owners wiping out the corners of their dogs' eyes

before showing them to the examining veterinary surgeon, and how many of these latter gentlemen have the time, even if they have the inclination, to take temperatures? Moreover, temperatures recorded amid the turmoil and excitement at the entrance of a show are notoriously unreliable. Apart from shows, however, it is still a difficult matter to say with certainty that a young dog is quite free from distemper infection. A great deal must be taken into consideration in giving an opinion. Of course, if he has been exposed to infection, only careful observation for ten days or a fortnight will decide whether the disease will develop or not. When large numbers of dogs are kept together it is almost impossible for any to be quite free from infection; the older the dog, however, the less likely is he to show any clinical symptoms—still he may be capable of carrying infection to others, and especially to young whelps. I cannot call to mind any place that I have seen where a large number of dogs are kept together in which I have not found clinical evidence of distemper. Very few of the hunt kennels are ever free from infection—dogs' homes never. One cannot help being struck with the fact that though many young foxhound whelps die of distemper when out at walk, frequently the greatest mortality occurs when they come in from walk and are for the first time introduced to kennel life. A number of young dogs are freshly brought from a life of comparatively perfect freedom, crowded together on ground and in kennels which are not free from the taint of previous year's infection—is it to be wondered at that so many suddenly develop the disease and die?

Many veterinary surgeons in practice declare they will not take distemper cases into their infirmary. Yet they do so nearly every day. They may not take in cases where there is a profuse discharge from the eyes and nose, but they do not seem to fear the introduction of that husky cough or that intractable diarrhœa. If one excludes distemper cases, the number taken in is diminished by more than half. I should advise any veterinary surgeon who was intending to make a speciality of dogs to either keep quite a small hospital and rigidly exclude every case in which there is room for any doubt, or keep a large infirmary and admit all and sundry. If he keeps a large establishment the difficulty of rigidly excluding distemper is almost insurmountable.

Distemper manifests itself in so many and various forms, the symptoms are so numerous and in our present state of insufficient knowledge each case seems to call for its own special treatment. In a bad outbreak in a district where several large kennels are situated,

it will show itself in all ways and one has apparently to treat all the more common ailments that the dog is heir to, while in reality only encountering the one disease. From the above remarks one would naturally suppose that distemper is a perfect godsend to the veterinary surgeon. It may be so to those who prescribe for each series of symptoms as they arise and lead their clients to believe that the dog is suffering from either cough, eczema, diarrhœa, jaundice, gastritis, epilepsy, pneumonia, bronchitis or common cold, but to those who in all these ailments see the one prevailing infection, with any secondary infections merely supervening as complications or sequels, the treatment will probably be of the simplest. For I believe those cases are most successfully treated where least medicine is given. I do not mean that the valuable assistance of medicine is not to be made use of, but that if one wishes to save one's patients or at least obtain a good percentage of recoveries, medicine should not be given unless for some very definite purpose, and when it is not confidently expected to assist in relieving the symptoms. The practice of giving "something in a bottle" is to be strongly condemned. If our patient does not require it, we have no right to prescribe it, as it may endanger his chance of recovery, by nauseating him and making him resent the administration of nourishment, which, according to my own experience, is of far greater importance than any drug in the pharmacopœia. This is especially true in regard to cats. If you have learned the secret of getting sick cats to take an adequate amount of nourishment you have mastered more than half the difficulties of treating them when ill. Of course if one only sees a very few dogs, it may seem desirable to make the case "worth attending" by the prescription of sundry bottles of medicine. A man should honestly try his utmost to cure the cases put under his care, and if he can do so best by refraining from prescribing medicine, no monetary consideration should tempt him to do other than what he considers best for his patient. Writing from my own experience, I say that in our present state of knowledge undoubtedly the secret of success in treating distemper is first to see the patient early and be able to diagnose the presence of the disease before complications have set in; the treatment is then very simple. Second, to take no risks, but be exacting in having the greatest care taken to protect the patient from sudden changes of temperature, damp, and from infection from other dogs; in fact to isolate him. Thirdly, have him nursed as if he were a human being. The greatest care is needed when the dog is apparently quite well, as a relapse is always far worse than the original disease.

How are we to recognize distemper when a case comes under our notice? This is a difficult question to answer, and one on which I can only venture an opinion.

Symptoms.

From a clinical point of view the disease in its simplest form is undoubtedly the most difficult to recognize; when complications ensue, the disease is manifest to the layman, and we, as a profession, should be able to make our diagnosis before the layman realizes from what disease the dog is suffering.

In the simplest form, the symptoms of distemper are essentially those of septicæmia. After infection there is probably a slight rise of temperature and there may be a little languor, but this is so slight that it is seldom, if ever, noticed. About five to fifteen days, which I believe to be the incubation period in the majority of cases, there is probably a little diarrhœa or vomiting. This may be very slight also, and calls for no comment on the part of the owner. The dog may refuse his meals for a day, but this is a symptom common to many minor ailments, and causes no alarm. If, however, all the skin, and especially the skin of the abdomen, flanks, elbows, thighs, the lips and ears be carefully searched every day there will nearly always be found one or two pustules or the scab or scar left by a pustule which has already become dried up. These pustules are quite distinctive, and are peculiar to distemper. They form rapidly in about four hours, having the appearance of a small rounded pink or red lump, something like a small heat-bump in man. In another two hours or so the swelling becomes translucent at its summit, and contains a thin clear fluid. The fluid rapidly becomes of a creamy consistence, and the swelling becomes a conical pustule with an irregular outline, sometimes circular and sometimes oval, and varying in size from that of a pin's head to that of a horse bean. They become ruptured in from six to twelve hours after maturity, the contents drying into a brownish scaly scab. If this is picked off, there is left a pitlike depression, and if the pustule has been large, the healing of this depression leaves a distinct scar.

These vesicles may be discrete or confluent, there may be only one, or there may be hundreds. In the earliest stage it is commonest to find only a few. This is the primary rash of distemper, and unless carefully searched for will probably be missed, as it is evanescent, the pustules often forming and drying in twenty hours. If the vesicles have not been noticed except when pointing with purulent material, they may often be mistaken for insect bites, especially those of the

harvest bug, or the scab may be mistaken for scurf, and especially so if the dog has recently had sulphur ointment applied for some skin disease, or if he has lice on his skin.

Particular attention is drawn to this eruption, as in the early stage, at least, it is the only certain evidence which we have that the dog has distemper infection in his system. No dog showing such an eruption ought to be allowed to enter a show on any consideration. When once it has been noted, the patient should be kept under observation. No further symptoms may be noticed, but the dog can hardly be considered to be safe or free from further distemper symptoms for six weeks. This may seem an abnormally long period of quarantine, but I am satisfied that the infection may remain latent in the system for a long period, ready to show itself whenever the vitality of the patient is lowered and his power of resistance weakened.

If now the disease progresses a regular sequence of symptoms is noticed. The most noticeable is want of condition. The patient does not thrive, and, in spite of good feeding, not only fails to put on flesh but even loses weight. His temperature is sometimes normal, and sometimes subnormal, his heart is slow or intermittent, he loses his happy look, and is more or less dejected, though at times he may be roused and play like a healthy dog, but he soon tires and spends more hours than usual sleeping.

His appetite is capricious and occasionally he vomits after food and may have a husky cough. His bowels do not act with regularity. He may be constipated for one or two days, but generally has an intermittent rather intractable diarrhœa. The coat loses its gloss and becomes harsh and staring, while the skin is more or less leathery and often carries an unpleasant doggy odour and often is slightly moist. This condition may continue for several weeks. To most people the dog is merely a "bad doer" and receives no particular attention.

The eyes nearly always show a minute speck of greyish-coloured mucoid discharge at the inner canthus, especially in the mornings, but this discharge is not purulent like the discharge seen in advanced cases. The nose is sometimes moist, and there is seldom any noticeable discharge from it. The lining membrane of the ear is nearly always more moist or greasy than usual owing to a slight seborrhœa, and the dog is now particularly liable to parasitic canker. He easily becomes the host of various parasites, both internal and external, his lowered vitality rendering him less energetic in avoiding or killing skin parasites, while his depraved ppetite leads him to eat filth and with it infect his stomach or bowels with worms.

If the dog be now exposed to cold, damp or fresh infection, distemper develops quickly. The temperature is raised a degree or so, but may rapidly fall again, appetite is lost and possibly there is rigor or even a slight convulsion. Emaciation progresses very rapidly, and the dog becomes semicomatose. There is a purulent discharge from the eye, but only very small in quantity, the nose is dry and hard and often covered with a gummy scale. The mouth is dry and the lips, tongue and pharynx often ulcerated, while the odour of the breath is very offensive. Diarrhœa is frequently present and the fæces are often streaked with blood. The heart sounds are generally partially obscured by pericardial effusion and small areas of broncho-pneumonia may with difficulty be located by careful auscultation. At this stage—about the fifth to ninth since the second invasion—the patient dies of exhaustion and death is frequently ushered in by convulsions or persistent coma.

At any time during this secondary stage of the disease a fresh (secondary) eruption of vesicles may be seen. The pustules are less frequently discrete and they are generally more numerous and do not tend to heal so quickly. When ruptured the sore may ulcerate and the ulcer may burrow deep into subcutaneous structures.

If recovery takes place, either on account of good nursing or from the *vis medicatrix naturæ* there is a gradual amelioration of the patient's condition shown first in the general appearance. The eyes are brighter, and the dog takes interest in his general surroundings, ulcers heal, appetite and bodily power returns, and last of all the discharge from the eyes and the diarrhœa cease.

The symptoms I have recorded are those commonly seen in a case of simple uncomplicated distemper. In some cases these symptoms, though present, may be partly obscured or lost sight of owing to less common manifestations of the disease being more strongly in evidence. For instance, before the owner realizes the presence of distemper, he may find his dog suffering from icterus. This often proves very troublesome, and in packs of hounds causes great mortality. The absorption of the bile does not arise from blocking of the bile duct, or from overloading of the gall-bladder, for at many *post-mortems* I have invariably found the duct quite patent, and the gall-bladder seldom more distended than in a healthy dog, moreover, the duodenum has shown little or no sign of catarrh. Another condition, not always seen, is deep coma from the commencement of the second infection. This is often accompanied by a very subnormal or very high temperature.

In the former case the dog generally dies without a struggle and without regaining consciousness, while in the latter the coma often gives place to violent convulsions, which nearly always end fatally. Another condition less frequently seen is a state of hypersensitiveness. This is a manifestation of infection of the spinal cord, and may indicate myelitis or spinal meningitis. Sometimes it causes regular convulsions, but more often merely hyperæsthesia and tremor of various groups of muscles, especially those of the legs and head. It is commonly followed by chorea or paralysis.

If the case is protracted, certain other symptoms are fairly common. The eyes, and especially those of the short-nosed dogs, are liable to give great trouble. The conjunctivæ become suddenly highly inflamed, tears flow abundantly, and there is marked photophobia. The inflammation has a great tendency to spread to the deeper structures, and there may be a panophthalmia followed by loss of the eye, or the cornea may ulcerate, commonly at the centre or upper internal portion. The ulcer may be followed by staphyloma, it may penetrate an anterior chamber, and the aqueous humour may escape and even carry with it part of the iris. The ulcer becomes connected with the sclerotic by arborescent vessels, the cornea becomes opaque, and the sight is impaired or lost. Another symptom, not always met with, is the development of subcutaneous abscesses. These are very troublesome, and if not quickly evacuated may cause death from septic absorption. Even when well drained and dressed they often take long to heal and leave ugly scars. Frequently, when occurring in numbers, they may at first sight be confused with follicular mange, and they are often followed by complete temporary loss of hair over nearly all the body. Probably there is no disease which, running concurrently with distemper, does not become increased in severity itself, while at the same time emphasizing each symptom of distemper. When a dog with distemper becomes infected with another disease or with distemper from another source, the original infection becomes exalted. This is shown by markedly rapid emaciation and a temporary rise or fall of the body temperature, an increase in the severity of the symptoms already reviewed, together with a manifestation of the symptoms of the complicating ailment. The commonest complication is common coryza, or nasal catarrh, giving the name "Snuffles" or "Snifters" to the disease so recognized. The other common and very fatal complication is lobar or purulent pneumonia, easily distinguishable from the slight broncho-pneumonia so frequently seen in the secondary stage of simple distemper.

Diagnosis.

In the diagnosis of distemper we meet with our greatest difficulty in the early stages. When the disease is well established diagnosis is easy, but proportionately as symptoms increase making diagnosis easy, so treatment becomes more complicated. For simple and successful treatment in a large number of cases it is essential to make an early diagnosis and to keep the patient under observation.

In all cases of dogs under 2 years old which are brought with a history of malaise, diarrhœa, loss of appetite, suspect distemper and carefully examine the eyes for a watery or mucoid discharge and the skin for any pustule or trace of a pustule.

In all cases of puppies under 9 months brought with a history of vomiting, convulsions, or diarrhœa, especially if there is loss of appetite, suspect distemper and search for the eruption. In this case the majority of people would probably say suspect worms. No doubt worms do cause a lot of trouble in puppies, but thousands of wretched little puppies have their lives made miserable and their health shattered by continual "worming" when the real cause of their not thriving and of having so-called "puppy eczema" is not worms, but distemper. The emaciation caused by distempter is general, and the belly is usually pinched up. The skin nearly always has a peculiar sickly smell, is often moist, and the pustules, if present, are easily seen and generally discrete. Emaciation from worms is never so rapid, and the growth of the skeleton is not so much interfered with, the belly is distended unevenly, and the stomach and duodenum can often be felt hugely dilated under the skin and muscles on the left side. The pup is, in fact, pot-bellied. The skin is dry and often scurfy, or there may be a slight erythema, but worms do not cause pustules on the skin.

In any case of a dog brought with the history of a husky cough and loss of condition after having been to a show, or after being at a veterinary surgeon's kennel, especially the larger of these establishments, one should certainly suspect distemper. Not only is the disease so common and prevalent, but such little real care is taken to exclude infectious cases that wheresoever many dogs are gathered together there surely will distemper be found. There are many breeders and many who regularly show who say there are diseases named "influenza" and "show-bench cough," and they admit that they are contagious; this is distemper proper, and it is only the unwillingness of breeders to admit that they have the real disease in their kennels that makes them find for it some fancy name.

In any case where in a young dog there is progressive emaciation, unthriftiness, lack of appetite over a considerable period, together with an abnormal readiness to sleep through most of the daylight hours—suspect distemper. In these cases one may have to wait a long time before having one's suspicions confirmed, but when confirmatory symptoms arrive the case often runs a rapid course, and frequently ends fatally—often in coma or convulsions. This is the so-called suppressed distemper, and is one of the most difficult forms to diagnose and to treat.

In practice one has not to treat many cases other than distemper or arising out of distemper—surgical cases excluded. Even the fact that a casual patient is under 18 months old should put a veterinary surgeon on his guard lest he overlooks this prevalent disease. Often a puppy is brought with a history of having suddenly gone mad, or having a screaming fit in the street, and it is generally supposed that he has worms. Such cases, if kept under observation, only too frequently develop other symptoms, such as rapid emaciation and a discharge from the eyes. In these cases the eruption is not always seen, and the convulsions or emaciation and depression are the only symptoms of a bacterial intoxication of the system.

In examining a dog rapidly in order to diagnose the presence or absence of distemper—a duty required of many of us at shows—it is best to first look at the dog's eyes, close the lids, and press the eye inwards, opening first the lower lid while the membrana nictitans is still across the eye and searching for any discharge that may be hidden in the pocket of the inner canthus. Do not fail to remember that most doggy people at a show wipe their dogs' eyes carefully before showing them to the veterinary surgeon at the door. Next look at the skin of the belly and thighs and under the elbows and inside the ear, searching for any trace of a pustule; notice his general condition. If there be any doubt put him on one side and examine him more carefully when there is more time for the job. It is well to become well acquainted with the pustular eruption and the remains of it, and it is unlike other skin affections, and when once seen it is easily recognized.

Do not be led astray by anything that may be said by the owner; you will frequently be told that the dog has already had distemper, but that is no reason that he should not contract it again, especially from a fresh source. You may be told that the dog had distemper within the last three months and therefore he cannot now be suffering from it as he got it quite well. In such cases remember that relapses are very common, and that a dog recovered or recovering from the disease is

very subject not only to relapse owing to want of care on the part of the owner, but also to fresh infection from another source.

The value of the thermometer in diagnosing distemper has been unduly overrated by most writers. If you depend upon your thermometer for the diagnosis of distemper, I believe that a vast number of your cases will go undiagnosed. If a temperature chart be kept of a case under observation, the rise or fall of the body heat is often of great service in enabling one to give a prognosis, for, while at a single observation the height of the body temperature is no indication of the presence or absence of distemper, a continued series of such observations in a case where the disease is known to exist records the advent of complications or the beginning of new infections from a fresh source.

If these statements be accepted, it will be at once apparent that to reject a dog at a show merely because he has a slightly raised temperature is neither fair to the dog nor his owner. At all times one must not allow one's perception of the disease to be obscured by the many other symptoms which may arise during its course; one may look beyond these at the disease itself.

Prognosis.

The prognosis of distemper is always guarded. The most hopeful cases often end fatally, while on the contrary many apparently hopeless cases recover. The prognosis varies somewhat with the breed of the patient; it is never good in any short-nosed dog; in Japanese it is always grave. Foreign dogs are generally more seriously affected in this country than natives; in any dog which is inbred it is not so hopeful as in a dog which has been bred from divergent stock—such are more prone to affections of the nervous system. Pampered animals suffer more than those which have had an early struggle for existence, and those dogs which have had a previous severe attack acquire a certain immunity; but this is not an invariable rule, for even they may succumb to a fresh and virulent infection. A protracted case is never so hopeful as one which runs its course quickly, and a protracted case in which complications set in late generally ends fatally. A sudden rise of temperature after a long spell with the temperature normal or subnormal generally heralds death from pneumonia or convulsions, while a continual loss of heat shows profound depression of all the vital functions with coma and exhaustion. A sudden fall generally foreshadows death from syncope.

A profuse eruption may be taken as a good sign, for it must be

better to have such purulent material out of the system as soon as possible. For this reason a sudden cessation of all eruption, or a sudden ceasing of diarrhœa, are not good signs, and often precede convulsion and other symptoms of nervous intoxication. Any rapid change, in fact, in the symptoms is not to be welcomed; even a sudden appetite for solid food after a long period of forced feeding. One should be on one's guard against satisfying this craving, for such a meal is often followed by convulsions.

In this disease there should be no need to despair of any case so long as life and consciousness remain, but the longer recovery is delayed the less likely is it to be established.

Treatment.

In the first place, there is no specific treatment for the disease, and well it is so, for the public would soon learn its nature, and nearly half of our present dog patients would not come under our hands.

It is a pity the public does not realize the fact that all the so-called specifics and cures so freely advertised are practically useless. It is a pity also that many veterinary surgeons do not realize that any single drug or combination of drugs cannot be considered suitable for all cases. I have seen some who have one bottle of pills, or a mixture labelled "Distemper," and each and every case is dosed from that bottle, no matter what symptoms may be presented. In fact, the patient must be made to conform to the attendant's routine, treatment or fad.

For those who take dog practice seriously distemper is a source of great trouble, and the care of the patient a continual anxiety; for the most hopeful cases often die in spite of all that may be done for them. Having, during the last two or three years, seen an exceptional number of cases (for distemper has been very severe in my district), I have become almost a fatalist as to a dog's chance of recovery. Many dogs will recover without treatment, and others will die, no matter what is done for them, and others, I fear, get well *in spite of* the excessive treatment they receive. A great deal, of course, depends on the breed and constitution of the patient, but more, I believe, on the virulence and source of the infection. In one outbreak nearly all will die, in another deaths will be very few. So also deaths may occur frequently in one family, while all the members of another survive. It is hard to realize this when attending single cases, but it is very noticeable in large outbreaks and in epidemics.

I say nothing as to preventive treatment. I leave that to those

who profess to know about it. I do not; and I maintain that until we can be absolutely certain of the cause of the disease we cannot obtain any preventive agent that is worthy of consideration. I have tried a large number of so-called preventives, and have found them of very doubtful value, if not useless. Good health and careful avoidance of dog shows and large kennels is still the best safeguard against infection.

To my mind, the secret of such measure of success as we may hope for in treating distemper depends upon three main things; (1) The early recognition of the disease: (2) the isolation of the patient; (3) good nursing, and the use of appropriate medicine. This may not necessarily be true in single cases, but it is emphatically true when one reviews the course of several hundred cases.

With regard to my first point—the early recognition of the disease—I fear that I am at variance with a large number of the profession. I maintain that the presence of the cutaneous eruption is absolutely diagnostic of the disease, even in its earliest stage. This eruption is not considered diagnostic by many, while others, though admitting it to often be suggestive of distemper, do not consider the patient infectious, and do not think it necessary to take any precautions for the patient's welfare. One has only to examine the dogs at any show to see that what I say is true.

I fully realize that what I recognize as distemper in its early stage is not believed to be distemper at all by a very large number of veterinarians. I have had ample proof of this, and am continually getting more. Dogs suffering from distemper are brought to me from all parts, which have been treated for various complaints—complaints bearing any name but distemper, and I am satisfied that the veterinary attendant in each case has been treating symptoms without searching for their true cause, giving the name of some special disease to each symptom as it has arisen. In this way the disease is allowed to get established in the dog before proper precautions are taken; in this way the disease is often spread through large kennels. The commonest cases that I see which have been unrecognized are those presenting symptoms of general unthriftiness, indigestion, intractable diarrhœa, ulcerated mouth, or such like. Had these cases been early put under proper supervision, it is quite probable that the symptoms complained of would not have arisen.

As I believe that many dogs do not show any further symptoms of the disease than the skin eruption, so I say that if such cases are isolated and given such care as to ensure good nourishment and to

prevent chill or secondary infection, they will, more often than not run a mild course and make a good recovery without further treatment. The course of the disease, however, must necessarily depend upon the virulence and source of infection. Granted the early recognition of the disease, treatment is of the simplest, and frequently no medicine is required.

When a case is not seen early, or when a simple case has become secondarily infected, or infected from a fresh source, or subjected to chill or other lowering influence, such as the abuse of drugs, or when a relapse has occurred, then very often great difficulty is experienced in bringing such a case to a satisfactory termination. Here good nursing is of paramount importance, and here also skill is required in the choice of appropriate drugs suitable to the case in hand. Naturally a wide discretion must be allowed to the medical attendant in his choice of drugs, and each case must be treated on its merits, and so-called "routine practice" (which, to my mind, is another name for professional laziness) must be abolished. Drugs which are suitable to many cases in one outbreak may be useless to those of another. On many occasions more good may be done by refraining from dosing than by prescribing medicine. This should be made clear to the owner, that he may not think his adviser lacking in ability to treat the case, and so lose confidence because there is no syrupus rosæ in the dispensary. Though it may go against our financial interests, occasionally, at least, our business instincts must be made subservient to our professional training and dignity.

In an excellent chapter devoted to the treatment of distemper in a recent book on therapeutics a well-known writer gives one or two prescriptions for almost every symptom of the disease that may be presented. This is typical of most contributions to our literature on the subject, and I regret it because such essays often make a profound impression upon the reader, especially if he be a student, and tend towards making him blindly follow the lines laid down. His method becomes stereotyped and himself unable to take a broad view ; in fact, he drops easily into routine practice. Anyone reading such a work is led to believe that medicine must play a great part in treating distemper, and that each symptom must be treated as it arises, each with its own bottle of mixture. This may be good for the pocket, but I do not believe that it is good for the patient. It is hard to say that each symptom is benefited by the medicine prescribed for it, for other similar cases get well just as quickly, and often more quickly, when no special medicine has been given. For instance, I think it a mis-

take to try to stop the intermittent diarrhœa. Untreated, it often alternates with obstinate constipation, and the treatment of the diarrhœa will probably only aggravate the constipation, and *vice versa.*

In any case it is most necessary that the administration of medicine shall not in any way interfere with the feeding of the dog. It is of greater importance that he should feed voluntarily than that he should be nauseated with castor oil and buckthorn or put off his food with opium, paregoric, sweet spirit of nitre, or such like.

This brings me to the subject of nursing. To my mind, the sooner the patient on being recognized as suffering from distemper is isolated as a sick dog the better his chance of recovery. He should be rigidly kept from immediate or intermediate contact with all other dogs for at least a fortnight. The other general conditions most necessary are plenty of fresh air and sunlight if possible, careful protection against damp and all depressing influences, together with the regular administration of nourishing food. To such a meeting as this I need not insist on scrupulous cleanliness. Unless complications have arisen warmth is not very essential, though very low temperatures and rapid variations should be avoided. From 50° to 60° F. is a good temperature. Dogs do badly in hot, stuffy rooms. The best food is undoubtedly milk. I think it is best to put a patient at once on a milk diet, allowing him as much as he will take to drink, and feeding him with rice puddings or sponge cake soaked in milk, and such-like foods. If milk in quantity makes him sick, it may be tried diluted with Vichy water, which dogs take readily. Lactol is useful, but I have had best results from feeding on Savory and Moore's prepared food, especially in puppies. Meat juices may be used provided they are not too salt. Often they are very gelatinous, and this, while making them appear dainty, frequently causes undue thirst. The best meat juice, in my opinion, is that which we can prepare ourselves by pressing fresh, lean, raw beef.

Food, of whatever kind, should be given in small quantities and frequently—that is, *at least* four times in twenty-four hours. If the case becomes complicated, and even when recovery seems assured, the greatest care must be taken over this question of feeding. No matter how well fed the patient, he will lose flesh and condition ; till the infection has, so to speak, exhausted itself, no amount of nourishment will cause him to gain weight. This rapid loss of flesh often leads the owner to believe that the dog is not getting enough nourishment, and consequently the patient is forced with more food than his system can assimilate. This is almost worse than starvation, and is

liable to cause severe complications, such as diarrhœa, vomiting, or convulsions. What little the patient will take voluntarily is of infinitely more value to him than the best of nourishment forced upon an unwilling stomach.

Particular care should be taken to see that any sudden ravenous hunger following a poor appetite should not be gratified. This always denotes some critical change in the course of the disease, and frequently, if it does not usher in convulsions, these at least are almost certain to follow a good meal after a period of anorexia. For a similar reason a sudden change to solid food is decidedly dangerous. If an uncomplicated case has run for a fortnight, and the patient seems to be going on well, he may be taken out in the open air during the warm hours of the day if the weather be good, but he must not be urged to exercise himself, and he must not be allowed to get tired. Violent exercise should be strictly prohibited for another fourteen days at least. A long walk or a quick run, or even a half day with the guns for a sporting dog may cause a serious relapse, and this is far more difficult to treat than the original illness.

Common-sense should guide us in these as in all things, and we should not expect more of the dog than we should of ourselves had we been suffering from a disease of equal severity.

As to the treatment of the disease by the aid of drugs I have not a great deal to say. No drug seems to be of undoubted use in all cases, but there are a few which are of especial value in a large number. Quinine and the salicylates are used by nearly all in some form or another, and more often than not with some good results. For very many years yeast has been used and with very good effect. At the present day I believe it the most valuable remedy we possess. I have tried various preparations of it, and I think the best is nuclein or nucleinic acid. If started early in the disease and continued steadily it has a marked beneficial effect. It seems to assist the tissues to resist the infective process. Another general remedy which may be used with success, both as a food and as a curative agent, is sour milk. Some dogs will drink this readily, and provided they will drink sufficient it is remarkable how well they do on it. Small doses of thyroid extract also seem to have a beneficial effect on tissue metabolism and help the patient to throw off the disease. I assume that this is so as there is nearly always some steady increase in weight after its administration.

To review all the many and various phases of complicated cases of distemper and to give in detail my ideas as to the best method of

treating them would occupy too much of your time and, I fear, would prove tedious. Let me therefore merely call to your minds some of the difficulties which we have to contend with in treating cases, and state shortly what I believe is best to be done.

The greatest difficulty is generally loss of appetite. This is a matter more for the nurse to contend with than the medical attendant, but the latter must have a list of palatable and nourishing foods at his finger ends, so that he may be able to suggest a suitable diet. Some dogs prefer dry food, and such dogs generally prefer lean meat cooked or raw. Sometimes they will not eat meat, but they will often readily eat stale sponge cake or sweet biscuits, if given dry. If the patient will take sloppy foods, stewed rabbit and rice will often tempt him when all else fails. Chicken and game are of little value, and only too often are not digested. If food has to be forced upon the dog fresh raw beef juice or milk are the best foods that can be chosen.

If there is no lack of appetite the disease generally terminates favourably, especially if the dog does not lose flesh to any great extent. With regard to the diarrhœa, which is so often troublesome and intractable, this does not seem to need treatment by drugs, as it will nearly always stop of itself, though it is often the last symptom to disappear. The trouble arises in the fact that it frequently is the precursor of dysentery and mucous colitis or ulceration of the rectum —conditions which may prove impossible to cure. The bismuth salts are useful here, as are also hæmatoxylin and opium. I have found rectal injections not of great benefit, and their administration is generally objectionable, both to the patient and his owner. Some few cases have recovered wonderfully by the use of chlorodyne, but I find the opiates as a rule very uncertain in their action on the bowel of the dog. Milk is the best diet, fresh or peptonized, and, if the dog will take it, sour milk will often effect a cure when ordinary medicines fail. If the case runs on to dysentery or ulceration of the rectum, it is nearly always fatal, and there is little that can be done. The incessant tenesmus is almost impossible to stop, though the opiates have some beneficial effect. In some of these cases, when I have had the opportunity of making a *post mortem*, I have found the cæcum and upper part of the posterior bowel so enormously dilated as to occupy three parts of the abdominal cavity. This over-distension will, of itself, cause continual straining, and in such cases I know of no cure. The next greatest difficulty, in my opinion, is the satisfactory treatment of the nervous symptoms that are so common in the disease. The most fatal are undoubtedly meningitis and coma. The convulsions and the general

attitude and manners of the patient are very distinctive in meningitis, and such cases are best destroyed as soon as possible. Setoning in the nape of the neck has been advocated, but I have not found it of any use, and I think the benefit to be derived from such a kind of treatment would have to be very sure and certain before I should advise such a very cruel expedient.

Coma is nearly as unsatisfactory to treat. If stimulants are given the probability is that coma will only give place to delirium and death. Ordinary convulsions are not so fatal, and many cases are saved by prompt treatment. It is most important to take action in time, before the fits are frequent or severe, and especially so if they are associated with high temperature. While they only consist of a champing of the jaw, or abnormal dribbling of saliva, they may be stopped by the use of bromides. I find strontium bromide in syrup most effectual, and the drug may be pushed to such a point that the dog loses all power in his limbs. After three or four days, as the drug is discontinued, the muscles regain their function and the fits do not recur. In meningitis bromides are no use at all, and if anything they only irritate and make the case worse. In chorea, when the disease is established or become chronic, I do not believe that drugs are of any value. If a case is going to get well it will get well without their use. In the early stages, however, when the temperature is high, aspirin, antifebrin, and such-like drugs are very useful, and it is always my practice to make use of them, for I believe that in this way the progress of the disease may be checked.

Jaundice is believed generally to be one of the most fatal symptoms of distemper, and most difficult to treat. I cannot say that this has been my experience even among cases in several packs of hounds. I have generally found that the patients die of catarrhal pneumonia, which only too often supervenes. If the patient can be protected from lung complications the jaundice will generally give way to treatment, but the treatment in this case must be very active, and milk is the only safe diet. I have had bad cases even in such breeds as bloodhounds, setters, and Japanese, and the losses have only been among those in which there were lung complications. In this, as in all other phases of distemper, it is essential to see one's patient early. Probably the greater part of the mischief is done when once the yellow colour becomes apparent. The greatest difficulty experienced is to get the bowels to act freely and to get the owner to give the case sufficient nursing and sufficient food.

The last difficulty I shall mention is one which I very frequently

have to meet. I refer to the fact that breeders refuse to admit that dogs in their kennel are really suffering from *distemper*. You may call it by any other name. Influenza is, perhaps, the most popular.

It is most difficult to make the public realize that a dog with the characteristic eruption is already infected with distemper. They do not want the dog to have it, and, so long as the animal is not visibly ill to them, they will not believe, and they will not take the necessary precautions. Veterinary surgeons can act together and make it a point of honour to reject all such dogs from shows. This united action would sadly deplete the benches and greatly chagrin show committees, but it would go a long way towards decreasing the at present terribly high mortality of the disease. As I have repeatedly pointed out, the present veterinary examination at dog-shows is an absolute farce, and it is lowering to us as a profession; and I, for one, shall resolutely refuse to act for any show under the present unsatisfactory conditions.

Let me now sum up my remarks, in conclusion.

It is very necessary to recognize the disease in its earliest stages, and take the case in hand for treatment. Nursing must be of the very best, and medicinal treatment of the very simplest.

There must be no excess of nourishment, but what is given must be of the simplest and most easily digested, and, if possible, taken voluntarily.

The greatest care must be taken to prevent fresh infection and relapse.

Remember the severity of the disease, and take every precaution to ensure a good convalescence. Remember how long it takes a human being to throw off influenza and such-like diseases, and do not expect the poor dog to do much better than the more highly developed creature—his master.

NOTES ON *TRYPANOSOMA DIMORPHON*—CORRECTIONS.

In the Veterinary Journal for January of this year we published an article by L. E. W. Bevan, M.R.C.V.S., under the heading "Notes Concerning *Trypanosoma Dimorphon*." We have received the following corrections from Mr. Bevan: The last paragraph on page 13 commencing "As is well known . . ." to "extension of the organism first found in the Gambia," on page 14, should have been in inverted commas, being a quotation from Montgomery.

Mr. Bevan also writes: "Under measurements (page 16) I should have said 'forms about 20 μ long predominate' . . . not '30 μ.'"

THE DRUG TREATMENT OF CANINE PIROPLASMOSIS.[1]

BY G. A. F. NUTTALL, M.D., PH.D., SC.D., F.R.S.
Quick Professor of Biology, Cambridge.

THE CONTINUED INFECTIVITY OF THE BLOOD OF DOGS WHICH HAVE RECOVERED FROM PIROPLASMOSIS AFTER TREATMENT WITH TRYPANBLUE AND TRYPANRED.

IN a previous paper by Nuttall and Hadwen the cases of four dogs were described which had survived an attack of piroplasmosis consequent upon treatment. The dogs (Nos. 1, 3, 4, and 6) appeared quite well at the time we published the account of our experiments. Whereas some of our other dogs which had been successfully treated succumbed to distemper, the four referred to escaped this intercurrent disease or (Dog 6) recovered from it. The following data refer to these four dogs, whose previous history is in each case briefly summarized, so as to render the subsequent record more intelligible.

Except for Dog 4, which is showing increasing signs of advancing age, all of the animals are at present healthy as far as outward appearances are concerned.[2] The body temperature has remained normal in the cases of Dogs 1 and 3, and in the cases of Dogs 4 and 6 has shown occasional slight rises which may have been due to other causes. The body weight has increased in all cases: from 15 to 17lb. (232nd day, Dog 1), from 17½ to 21lb. (235th day, Dog 3), from 20 to 25lb. (227th day, Old Dog 4), and from 16 to 20lb. (210th day, Dog 6). Parasites have not again been detected in the peripheral blood upon microscopic examination.

On the other hand, the parasites must have persisted in the animals, for blood taken from the ear-veins of the four dogs gave rise to fatal piroplasmosis in all of the test-dogs which were inoculated with it. Thus:—

The blood of Treated Dog No.	Day after inoculation of Treated Dog when its blood was collected	No. of Test Dog inoculated	No. of days after inoculation when Test Dog died of piroplasmosis
1	143	I.	19
3	190	II.	16
4	182	III.	13
6	165	IV.	21
6	210	V.	34

1 This article is abstracted from a very excellent paper on the subject, a reprint of which Professor Nuttall very kindly sent us. The original paper appeared in full in *Parasitology*, vol. ii., No. 4, February, 1910, and contains, in addition to our abstract, a *résumé* of the earlier work by various Italian investigators, and the details of experiments by Nuttall with the aniline dyes, brilliant green, benzopurpurine, and Congo red. Previous articles on the subject have appeared in the VETERINARY JOURNAL of December, 1909, and January, 1910.

2 Dog 6 has died since this was written. It was killed by fighting with another dog on the 236th day after inoculation.

It is obvious from the foregoing that the treated dogs behave, in respect to the survival of the parasites in their blood, similarly to animals which recover under natural conditions. They represent "salted" animals in which parasites persist for an indefinite time without apparently producing any ill effects, the number of parasites present in the blood being exceedingly small. Although the test dogs which were inoculated with the blood of the recovered animals lived somewhat longer than is usual after inoculation with the blood from acute cases of piroplasmosis, there is no evidence that the parasites in the blood of the recovered animals had in any way become attenuated.

Two of the recovered dogs were, moreover, re-inoculated with virulent blood, but neither of them showed any reaction. Dog 3 was re-inoculated on the 221st day after the first inoculation, and Dog 4 was similarly re-inoculated on the 213th day.

Conclusions.—It is evident from these experiments, protocols concerning which are given in the original paper, that the parasites persist in the blood of dogs which have recovered from an acute attack of piroplasmosis in consequence of treatment with trypanblue and trypanred. The blood of such dogs was found to be infective and virulent 143 to 210 days after the treated dogs were first inoculated. In respect to the persistence of the parasites in their blood, the successfully treated dogs behave similarly to dogs which have recovered naturally. Two of the dogs which recovered after treatment were re-inoculated, with negative results, on the 213th and 221st day after the primary inoculation which produced the acute attack from which they recovered.

Summary and Conclusions.

The following summary and conclusions apply to the results of the experimental treatment of canine piroplasmosis by various authors, including myself:—

(1) Drugs which have been found ineffective in the treatment of canine piroplasmosis are:—

Arsacetin tested on one dog by Nuttall and Hadwen (1909).

Soamin tested on one dog by Nuttall and Hadwen (1909).

Sodium-methylarsenate tested on two dogs by Nuttall and Graham-Smith (1908).

Tartar emetic tested on two dogs by Nuttall and Graham-Smith (1908).

Sodium nucleinate tested on two dogs by Levi della Vida (1907).

Beta-naphthylamine tested on two dogs by Nuttall and Graham-Smith (1908).

Brilliant green tested on two dogs by Levi della Vida (1907).

—— tested on one dog by Nuttall (1909).

Benzopurpurine tested on one dog by Nuttall (1909).

Tryparosan tested on two dogs by Nuttall and Hadwen (1909).

Methylene blue tested on two dogs by Levi della Vida (1907).

—— tested on two dogs by Nuttall and Graham-Smith (1908).

(2) Of doubtful value are:—

Fowler's solution tested on one dog by Levi della Vida (1907). The dog is stated to have had but a mild attack of piroplasmosis.

Atoxyl tested on six dogs by Gonder (1907) with negative results in that all of the dogs died of piroplasmosis. Levi della Vida (1907) states that he cured some dogs by atoxyl treatment, but does not state how many.

Quinine bihydrochloride tested on one dog by Nuttall and Graham-Smith (1908) with negative result. Memmo, Martoglio, and Adani (1905) state that they cured two dogs by injections of quinine, but give no particulars of their experiments.

Oil of turpentine tested on three dogs by Levi della Vida (1907) with negative results. Memmo, Martoglio, and Adani (1905), however, claim to have cured all of the twelve dogs they treated with turpentine.

(3) Apparently the following drugs may exert some effect:—

Dichlorobenzidine + two molecules of amido-napthol-disulpho, tested on twelve dogs, two of which recovered, Levi della Vida (1907).

Sodium cacodylate tested on seven dogs, six of which are stated to have recovered, Levi della Vida (1907). (I am about to test this remedy afresh, since the Italian author gives very few particulars regarding his experiments).

Congo Red tested on three dogs by Nuttall (1910). All of the dogs died, but the drugs exerted a decided effect upon the parasites.

(4) Definite curative or preventive effects are exerted by:—

Trypanblue ($C_{31}H_{24}N_6O_{14}S_4Na_4$, the tetrazo compound of toluidine and amidonaptholsulphonate of sodium) cured seven out of nine dogs in the experiments by Nuttall and Hadwen (1909), and when given early prevented the appearance of the parasites in the dogs' blood. These results have been confirmed by Jowett (1909) who tested the dye on fourteen dogs, two of which were moribund. The latter died, whilst twelve

recovered. Six of Jowett's cases were due to experimental infection, the others were cases of naturally acquired infection, and a number showed severe clinical symptoms. The drug is ineffective when given by the mouth.

Trypanred tested on two dogs by Nuttall and Hadwen (1909) caused the parasites to degenerate and disappear. (Further experiments with this dye are in progress. The initial experiments indicated that trypanred is not as satisfactory as trypanblue for purposes of treatment as it produces a more irritant effect.)

(5) In dogs which have recovered from piroplasmosis after treatment with trypanblue and trypanred the blood remains infective and virulent for six to seven months or more after treatment. Such dogs resist reinoculation with virulent blood obtained from dogs suffering from acute piroplasmosis, and consequently are to be regarded as "salted" animals. From a practical point of view the "salting" of dogs (and cattle) by the method of inoculation followed by the dye treatment appears to offer decided advantages. The method is at present on its trial in respect to cattle which are being "salted" in England prior to their exportation to Africa.

(6) In judging of the value of dyes in the treatment of piroplasmosis it is essential that accurate observations should be made with regard to their influence upon the parasites as well as upon the symptoms of the disease. Both in dogs and cattle the injection of trypanblue causes the pyriform parasites to disappear rapidly, the remaining parasites appear rounded and degenerated, and ultimately disappear from microscopic observation. Although the parasites may reappear in small numbers after some days their presence is not accompanied by outward symptoms, and the animals proceed to recovery. Relapses may, however, occasionally occur with the reappearance of parasites. Fatal relapses have only been observed in two of our dogs. The influence of the treatment upon the fever is very marked. Both in dogs and cattle suffering from piroplasmosis, the temperature usually falls rapidly to normal, and coincident with the fall in temperature there is a general improvement in the appearance of the animals. The effect of the dye appears to be to cut short the acute attack, and to convert it into a mild, chronic form of the disease, which seems to exert no injurious influence upon the animals. In fact, the animals may rapidly improve in condition as evidenced by a gain in body-weight and in appearance. Having recovered from the acute attack the animals harbour the parasites

in small numbers for a long time, and by virtue of the continued presence in their bodies of the piroplasms they continue, for a like period of time, to remain resistant to reinfection. Whereas the animals cannot be described as "cured" in the sense that they are rendered free from parasites, they are rendered proof against reinfection; in other words, they are "salted."

Judging from the immediate effect of the dye upon the parasites and upon the symptoms of piroplasmosis both in dogs and cattle, and the subsequent behaviour of the animals after treatment, I am fully convinced that trypanblue will prove of great value in practice until such time as we shall discover an equally efficient remedy not possessing the colouring properties of the dye. The fact that trypanblue dyes the tissues for a considerable length of time will necessarily militate to some extent against its usage in cases where cattle are intended for meat consumption, but it will assuredly protect valuable breeding animals which it is proposed to introduce into a country where piroplasmosis prevails. In the case of dogs, this objection will scarcely weigh in the balance as against saving the animal from a disease which is so commonly fatal. That the coloration of the tissues disappears with time is clear from the case of Dog 6, which was killed on the 236th day after the dye was injected, and found to be quite normal in appearance. Only further observations can determine how long the coloration of the tissues lasts in cattle and dogs, and it would be well if different observers recorded their experiences in this particular.

At present there exists to my knowledge no other remedy which will cure piroplasmosis in either cattle or dogs.

Clinical Articles.

THE VALUE OF RECTAL EXAMINATION IN CATTLE.

By AINSWORTH WILSON, F.R.C.V.S.
Witham, Essex.

It will be generally admitted that the palpation of the internal genital organs *per rectum* is often indicated in the larger domestic animals; a proper diagnosis of the various abnormalities and pathological conditions, which may or may not lead to sterility, can be made with certainty in a large proportion of cases.

A positive diagnosis may be of the greatest importance to determine the existence of pregnancy at different stages of gestation; internal examination is often necessary for this purpose.

The question may be asked, "Do we, as a profession, attach sufficient importance to rectal examination in cattle practice?" Personally, I have long felt that it has not received quite the attention it deserves in daily practice.

Many of us, I take it, can call to mind cases in which rectal exploration might have proved most useful, but unfortunately it was not resorted to.

This neglect, if neglect there be, does not apply to horse practice, in which the value of internal examination is universally recognized, more especially in bowel cases; and there are few practitioners who do not, as occasion arises, manipulate the pelvic and abdominal viscera through the rectal walls.

The two papers on Sterility recently published in the VETERINARY JOURNAL suggest the need for more extended and systematic exploration *per rectum et per vaginam.*

The editors are to be congratulated on bringing the valuable experiences of Continental experts within the reach of country veterinarians, to many of whom the original papers presented at The Hague last autumn must remain a sealed book.

Those who aspire to conquer sterility in bovines, and who make a systematic examination of the sexual organs, know how complex and exacting the problem really is. It requires the expenditure of a good deal of time and trouble, together with the keeping of careful records of each individual case.

To begin with, much practice is needed in the palpation of the genitals of the healthy cow at various physiological periods; while both the non-pregnant and the pregnant animal demand attention.

The experience and confidence gained in this way are of the greatest service in the detection of disease of any part of the genital tract, *e.g.*, ovarian cysts or persistent corpora lutea, or both ; thickening or occlusion of the oviducts ; chronic catarrhal or purulent endometritis ; pyometra and other collections in, and diseases of, the uterus ; mummified or macerated fœtus; imperforate vagina ; suspected retention of fragment of after-birth with contracted os ; torsion of uterus with occlusion of vagina ; spurious pregnancy ; straining, uneasiness, or colicky pains during gestation.

In the male animal the accessory glands near the bladder and a portion of the vasa deferentia are easily distinguished, and sexual soundness, so far as they are concerned, can be ascertained. The above will suffice to show the opportunities for manipulative or operative handling by the rectum in both mare and cow.

Rectal manipulation is not, however, confined to the organs of reproduction. It is most useful, in fact indispensable, in palpating the pelvic and some of the abdominal viscera, together with the bones, ligaments, glands, and blood-vessels. The bony and ligamentous framework of the pelvis and a considerable portion of the sublumbar region can be examined with more or less facility for fractures and other lesions. In paraplegia, for example, rectal examination should never be omitted. Cysts, abscesses, tumours, or dropsical collections may also be detected occasionally.

The urinary organs are well within reach, except the kidneys. which in big cows are situated too far forward for effective manipulation. The alimentary tract presents portions of the rumen, together with the small and large intestines. Several posterior groups of lymphatic glands are also within reach, a fact of some importance in the diagnosis of abdominal tuberculosis. Other pathological conditions of the tissues and organs available for manipulation will readily suggest themselves.

The following notes may help to emphasise the value of exploration *per rectum* in affections of the genital apparatus :—

I.—Pelvic Constriction—Artificial Abortion.

The subject was a nymphomaniac cow, aged 6. She had her last calf twenty months before. She became pregnant after sixth operation for cystic degeneration of (1) right ovary; (2) both ovaries. I examined her December 31, 1909, and found deformed pelvis with fractured shaft of ilium, and large callus formation. Normal parturition would have been impossible. The right ovary was the size of

a pigeon's egg, fibrous; left ovary, walnut size and little nodulated. The left horn was impregnated and the os closed; mucus thick and normal, and sacro-sciatic ligaments slightly relaxed.

Examined January 2, 1910, sixty hours after operation. The cow aborted a fresh four months calf. Two weeks later she showed signs of œstrum, and thereafter came on every three weeks. Neither the cysts nor the nymphomania recurred while she was being fed for the butcher.

II.—Mummified Fœtus—Dumb Œstrum.

The subject was a shorthorn cow, that had been clinically tuberculous two years. She had her sixth calf in December, 1908, was bulled in March, 1909, and believed by the owner to be pregnant.

I examined *per rectum* on first appearance of œstrum two to three weeks before the date she was due to calve. The left cornu was normal, but a mummified fœtus was in the other, 2 to 3 in. thick, 6 to 8 in. long, a firm, semicircular, irregular body; some bones crushed like egg-shells, curved spine plainly distinguished. The os admitted the index finger; ovaries normal, œstrum recurred normally and regularly, and the fœtus remained *in situ* for many weeks while the cow was being fattened; the os was closed between the periods.

III.—Spurious Pregnancy—Myxometra.

Jersey heifer, aged 2, believed in calf, was brought in from grass, and examined August 13, 1909. She had a poor appetite, upper flanks hollow, abdomen rather distended, eyes little sunken, heart's action rather weak, constipation and grinding of the teeth, temperature 102·6° F. There was a little reddish slime on the roof of tail and ventral surface; vulva very small (admits two fingers). I administered a draught containing ol. lini., pulv. opii and calomel; and left sodii bicarb.

August 14, 1909: Small quantity red mucus was found *per vaginam*. On examining *per rectum*, the uterus was found to be large, fluctuating, and more or less shapeless; sac containing several gallons fluid, cervical canal probably open. I attempted unsuccessfully to turn uterus and reach ovaries. I then administered hydrastis canadensis, and left large doses sodii bicarb. There was no straining, and the general health was improving.

August 15: Further improvement, but more discharge. The right ovary was reached with difficulty, and two yellow bodies pressed out. The left ovary was beyond reach under the distended horn.

August 16: The vulva had been relaxed, and admitted left hand; the cervix was further dilated with the fingers.

On the 18th the floor of box flooded with a slimy, odourless, red-tinged fluid, and the uterus was small on exploration. Involution proceeded rapidly and œstrum appeared nine days later. After three weeks' period she went to bull and proved in calf.

It is probable that this heifer aborted very early in pregnancy. This would account for the fluid in the uterus. She was one of nine, eight of which were forward in calf.

TREATMENT OF SUPRA-SCAPULA PARALYSIS.

By Professor W. C. SCHIMMEL.

Director (Principal) of the State Veterinary School, Utrecht.

In consequence of the case of supra-scapula paralysis communicated in the Veterinary Journal of March, 1910, by Captain G. P. Knott, A.V.C., may I be allowed to remark that this form of lameness, as a rule, cures in a short time, if only rest is given to the horse for at least a fortnight after the beginning, and when afterwards it is obliged to exercise itself daily in increasing measure. It is possible that an extravasation of blood in the course of the supra-scapula nerve has caused the paralysis by a compression of the nerve. Its resorption is favoured by rest. However, ten to fourteen days having passed, the horse, before the supra- and infra-spinatus muscles become wasted, should be exercised twice daily for at least half an hour, however defective the gait may be.

As Captain Knott observed, too, it can regularly be seen that the lameness diminishes proportionately to the increasing motion, and that in the same way the atrophy of the scapula muscles is respectively prevented or improved.

In most cases the horse begins too late with the forced and methodical continued motion; this happened *in casu*, too, and therefore it lasted such a long time before recovery was attained. Any other treatment of this paralysis is almost in vain; with massage, blisters, electricity, subcutaneous injection of veratrin, strychnine, &c., usually no cure is effected if the horse is kept at rest.

Walking exercise in the beginning, soon followed by trotting exercise, is the remedy by which recovery of the paralysis is generally brought about in a short time. This knowledge makes the prognosis of the fresh cases of supra-scapula paralysis as a rule favourable.

DISPLACEMENT OF THE URINARY BLADDER IN A HEIFER.

By S. J. MOTTON, M.R.C.V.S.

Penzance.

The term prolapse when applied to the urinary bladder designates a condition in which the bladder passes through a rupture of the vaginal wall so as to rest in the vulva or even project beyond the vulva. Except as such a prolapse, it would on first consideration appear to be impossible for the uninverted bladder, or any part of it, to protrude from the vulva. Such an accident, however, may occur, and the following case illustrates the fact.

On March 7 last, after difficult parturition, a small Guernsey heifer was observed to be down, unable to rise, and straining violently at intervals. Inability to rise after difficult calving is not very rare, and the owner, feeling satisfied that this would pass off in a few days, did not concern himself about it.

The afterbirth was expelled soon after the calf, and the attendant was at a loss to explain the straining until he noticed a rose-red prominence peeping from the vulval labiæ. However, like many of his kind he trusted to luck, and it was not until March 12, five days after it was first noticed, that we were sent for. The animal was still down and unable to rise, but she maintained the correct recumbent position, could turn herself, was feeding, chewing her cud, and had a normal temperature. The mass protruding from the vulva had now much increased in bulk, and outside the vulva had attained about half the size of a regulation Association football. Its surface was covered by the mucous membrane of the vagina, which was abraded in places.

So tightly did the protrusion fill the entrance to the vulva that considerable difficulty was experienced in passing a hand into the vulva. The os uteri was situated above it, and on palpation there was no room to doubt but that it was the urinary bladder displaced into the vulva and much distended by urine.

The wall of the vagina was, except for the above-mentioned abrasions, quite intact, but was, of course, very much stretched. The bladder had in some way been forced out of its normal position during parturition.

Before the bladder could be returned to its proper position it was necessary to remove the urine. This was accomplished by opening the urethra (which, like the bladder, had turned on itself)

with a finger, and owing to the sharp bend present in the urethra, this was at first difficult, but necessarily became more easy as the bladder decreased in size. But even when empty the organ could not at once be kept in its correct position because of the straining, which was now, however, less violent.

In order to prevent the bladder from coming outside again the vulva was stitched. A few doses of sedative medicine were prescribed, and the vagina was washed out daily with a warm antiseptic solution. During the four succeeding days the catheter was passed once daily. At the end of that time the bladder had recovered sufficient tone to empty itself, and was now occupying almost its normal position, while the wall of the vagina had considerably contracted. The heifer was strong enough to stand for an hour or two daily. To-day (March 28) she is well enough to be turned out to graze daily, and there appears to be no reason to fear any further trouble.

SINUS IN THE INFERIOR MAXILLARY BONE.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

Subject.—An aged farm-horse.

History.—The owner had for some time observed that the horse had difficulty in feeding; a swelling appeared on the lower jaw on the near side, which gradually increased in size.

On examination, the lower jaw was enormously swollen, hard to the touch, and painful. On the lower aspect, a short distance anterior to the submaxillary artery, an opening was discovered which admitted a probe. The instrument could be made to enter a large cavity formed in the bone.

The horse was cast, and an examination of the teeth carried out. The second molar tooth on the affected side was missing and a probe could be passed from the external opening in the jaw into the alveolar cavity of the missing tooth.

On manipulating the probe, a loose body could be distinctly felt in the cavity formed in the bone. This of course had to be removed, but the difficulty was to enlarge the opening so as to permit extraction. I tried a small trephine, but, in consequence of the thickness and hardness of the bone, it would not work. So I got a saw with a very fine point (one used for cutting key-holes), and after much

difficulty succeeded in enlarging the opening in the bone and removing the foreign body, which proved to be a molar tooth, much decayed and black in colour.

I next made a communication between the opening in the bone and the alveolar cavity, so that irrigation could be carried out. The cavity in the bone contained a very large amount of semi-masticated ingesta, which was removed after some trouble.

I regret that I cannot give the after-history of the case, as the animal was taken home next day, a journey of 30 miles; but I conclude that he must have recovered, as the fee was paid and I have heard nothing since from the owner.

If the fee had not been paid I should certainly have heard of the result: most probably it would not have been favourable.

SILVER WIRE SUTURES.

By W. STAPLEY, M.D., M.R.C.V.S.

Professor of Veterinary Surgery in the University of Melbourne.

HUMAN surgeons do not as a general practice bury silver wire. I have done so because I have been unable to close my abdominal wounds without tension too great for the practical application of chromic gut. I prefer silver wire to kangaroo tendon and to silk. Silk is not absorbed and as a permanent suture it is more liable to create trouble than wire. My experience of tendon has been unsatisfactory. I have had abscess follow its use. It is slippery stuff to work in a tense abdominal wall. Of course, surgeons teach that stitches should not be put in under tension. Had we followed this law our cases would have had to remain unsutured!

As yet, we have no aluminium bronze wire in Melbourne, so we are unable to use it. Economy suggests its use in place of silver wire. Copper wire electro-plated is difficult to use because the copper is exposed at the cut ends.

Canine Clinical Notes.

AN INTERESTING CASE OF CHOKING IN A DOG, WITH AN UNCOMMON SEQUEL.

By G. H. LIVESEY, M.R.C.V.S.
Hove.

THE subject of this note was a dachshund which met his death as as the result of swallowing a sharp bone which became arrested in the thoracic portion of his œsophagus and eventually penetrated his aorta.

I was hastily summoned to the dog very early one morning because he was vomiting blood. When I arrived at the house I was informed that the dog had jumped off his mistress's bed, on which he had been lying, and had three times vomited a considerable quantity of blood. On examining the vomit I found that it was practically pure blood, now coagulated, and not blood-tinged mucus. I then thought he must have ruptured a blood-vessel in his stomach.

The owner informed me that the dog had been under treatment at Lewes by Mr. Munby for subacute gastritis for five or six days previously. The only other history obtainable was that he had been into a wood on a foraging expedition, and on his return he was sick, as though he had been eating filth. Since then he had been difficult to feed, and had frequently vomited.

I subsequently consulted with Mr. Munby over the case, but the owner was so distressed by the frequent vomiting of blood that she persuaded me to take the dog home with me later in the day. Early the next morning, however, we found him dead, after having vomited a huge amount of blood.

The *post-mortem* examination revealed a piece of bone (vertebra of a sheep) lodged in the œsophagus just behind the level of the second rib. The transverse process of the offending lumbar vertebra had been broken and was wedge-shaped, and the point had been driven through the œsophageal wall and into the common aorta. When the bone was *in situ* its wedge-shape quite closed the aortic wound, but when the dog moved about, and the bone was slightly displaced, blood evidently passed along the track and into the stomach. When the bone was removed a probe could be passed easily through the œsophageal and aortic wounds into the heart. It is remarkable that the tough elastic tissue of aorta could be pierced in this way. No doubt the puncture was completed when the patient jumped from the bed, as no blood had been vomited until then. The ulceration of the œsophagus indicated that the bone must have been there quite a week.

GANGRENOUS STOMATITIS AND GASTRITIS IN A DOG —SPONTANEOUS RECOVERY.

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.

Professor in the Royal Veterinary College, London.

THIS most interesting case came under my notice on March 24. The patient was a mongrel Airedale terrier, male, about 2 years old. He followed the owner, a most intelligent boy, about 14 or 15 years old, into the house six weeks previously and refused to be sent away, so the boy adopted him. For the first three weeks the dog appeared perfectly well, but then he commenced to vomit. His appetite remained fair. He would eat small quantities of food, consisting of flesh meat, and biscuits, sometimes dry and sometimes soaked, and as he never took much at a time he was able to retain it. Frequently, however, during the day he would vomit a blackish liquid, very offensive in odour. He next began to dribble " black slimy stuff." Then diarrhœa commenced, the fæces being soft and yellow. The owner thought that the illness was probably due to worms, and so " worm medicine " (areca nut) was administered, but no worms were seen either before or after the dose. A week before being brought in to the clinique, while the dog was being fed on some fresh red beef he spat out " a dirty yellow bit of flesh, thin and doubled up." Since then he had fed better and got brighter in manner. The boy was not satisfied with him, however, because he remained thin and behaved in a peculiar manner when given water, appearing to " bite at it instead of lapping it." The above is the clear and lucid history as given by the boy, some of his own words being in inverted commas.

On examining the dog I found him to be quite bright, but thin and rather weak, in fact, when he jumped from a comparatively low table his legs collapsed under him, but he immediately regained his feet. There was no discharge from his eyes, and the colour of his conjunctiva was normal. On opening his mouth the cause of his inability to lap water was immediately visible. He had lost the whole of the fore portion of his tongue right back to the *fraenum linguæ*. No doubt this was the " dirty yellow bit of flesh " of which the boy had spoken. The wound of the stump of the tongue looked to be healing nicely, and there was now no offensive odour. The dog has not vomited for almost a week, and his appetite is improving. His temperature was 102·2° F. I offered the dog water, and the boy's description of the dog's method of trying to drink was shown to be quite correct. It took him a very long time to get even a small amount, and, of course, he got it more easily from a deep basin than from a shallow one.

I prescribed a little tonic medicine and a mild collutorium, and gave instructions as to feeding and providing water in a deep basin. The dog is now thriving well (March 31), and is learning to suck water. He is much stronger, and is rapidly gaining flesh, and the wound of the tongue is quite healed.

I am prompted to record this case to show how spontaneous recovery may occur in some cases of very serious disease. This dog was affected with a disease closely simulating the so-called "Stüttgart dog disease," which is undoubtedly fatal in a very large proportion of cases where the necrotic mouth lesion occurs. This dog, at any rate, had not had his natural recuperative powers reduced by the administration of nauseous drugs. Of course it must be remembered also that the patient was a young dog (estimated at 2 years old) and a mongrel, both points which, in my experience of this disease, assuming it to have Stüttgart disease, were enormously in his favour. On the other hand, I do not wish to detract from the beneficial effects that may be obtained from the judicious use of various drugs, but I do wish to emphasize that careful nursing is the all-important item of treatment, and that medicines are often worse than useless, especially if the patient fights against them.

In the general treatment of Stüttgart disease the drugs I most frequently rely upon are carbonate of bismuth and salol, the former as a gastric sedative to assist retention of small quantities of liquid food, and the latter as a general internal antiseptic. These drugs I alternate with brandy in milk. Mouth lesions I dress with iodine solutions and boracic mouth washes. From all accounts my results would appear to be rather more favourable than those obtained by many practitioners, but that may be due largely to the fact that a fair proportion of my patients are crossbreds, and probably possessed of greater stamina.

PAPILLOMATA IN THE DOG.

By G. MAYALL, M.R.C.V.S.

Norwich.

These little tumours may be encountered on the lips, gums and roof of the mouth in dogs. At times they cluster together, and affect a considerable surface on the inside of the upper lip or at the corners of the mouth or lower lip and gums. They may alter the position of a tooth when they are attached to the jaw by a hard firm base.

They are said to often disappear spontaneously, and there is reason for believing this, but when affecting a patient brought for treatment it does not do to accentuate this fact too much. I recently removed about twenty papillomata from the inside of the lips and gums of a Great Dane. Many of the warts of small dimensions were, however, left alone. A spaniel dog, too, with warts all over the roof of his mouth and inside his lips came under treatment; some of these were removed with the scissors. I do not stop here, however, but usually give the dogs iron and arsenic pills internally, and have their mouths swabbed or syringed out with vinegar and water, about equal parts. Both the above-mentioned animals made perfect recoveries, but I had the Great Dane under treatment again shortly after with one of his legs greatly swollen and inflamed from being rubbed with some stimulant liniment. The healthy foreleg measured at the elbow 7 in., and above the carpus 6 in., but the cellulitic one measured 10 in. and 9 in. respectively at these points. I bandaged the whole leg with linen soaked in ammon. chlor. and pot. nit. lotion, and internally gave syrup trifolium co. (Parke Davis) in teaspoonful doses three times daily. After a time the dog made a recovery. It is the first "big leg" I have ever seen in the dog.

PROSTATIC ENLARGEMENT CURED BY CASTRATION.

By FREDK. HOBDAY, F.R.C.V.S.

Kensington, W.

The patient, a valuable old English sheep-dog, aged 10, was for about two years the subject of a very obstinate constipation, which occurred at intervals and caused violent straining. Aperient medicines gave temporary relief, but a large perineal hernia, quite as large as a good-sized cocoanut, eventually developed, and the attacks of pain occurred at more frequent intervals and became more prolonged on each occasion. Rectal examination revealed an enlarged prostate, quite the size of a tangerine orange, and painful on pressure. Treatment by potassium iodide and other drugs not being satisfactory, the owner was advised to allow the operation of castration, and this was performed on January 13. The scrotal wounds healed without any trouble, in fact by primary union, the sutures were removed on the fifth day, and the patient began steadily to improve almost immediately. At the present time (March) the prostate has atrophied, and is less than normal in size, the pelvic hernia is very much reduced and able

to be manipulated without pain, and the attacks of constipation have completely disappeared. The patient has lost the haggard expression he used to have, and is also much improved in bodily flesh. This case is further testimony to the value of the operation of castration for enlarged prostate, and a typical illustration of a number of these cases in old dogs which have come under my notice.

AN INTERESTING OVARO-HYSTERECTOMY.

By FREDK. HOBDAY, F.R.C.V.S.

Kensington, W.

THE patient, a very valuable Pekingese bitch, aged 5, had already had two litters of puppies, and was now heavy in whelp again. My attention was first drawn to her in January last, as she was said by the owner to have fainted once or twice and to be apparently losing the use of her hind legs. When I first saw her I diagnosed the symptoms as being due to the very heavy litter of puppies which were distending the abdomen, and, as she was only five days off the date of whelping, I endeavoured by careful nursing, dieting, and the judicious use of stimulants to keep her going along until the auspicious event was actually due. Two days later I was urgently summoned to see her, as the owner thought she would die. She was at times breathing heavily and in a laboured manner, but with care this passed off for another twenty-four hours. On the following day (two days before she was actually due to whelp) she was taken so very ill that I decided to operate immediately, and under the anæsthetic influence of chloroform, ovaro-hysterectomy was performed, eight very fine, well-developed, living puppies being removed. Tincture of iodine was used as the external antiseptic for the skin, and the wound was not touched at all until exactly a week afterwards, when the sutures were removed. The bitch made an uninterrupted recovery, and the puppies were placed with a foster-mother. They lived for five days and appeared to thrive well, but, owing to an unfortunate incident, they were allowed to get in a cold place, and all the litter died in one night.

The case illustrates many interesting points, especially the initial symptoms of collapse before the accouchement was actually due, the number and size of the puppies, and the excellent healing of the wound afterwards without further dressing or interference.

Abstracts and Reports.

LEUCOCYTES IN MILK: METHODS OF DETERMINATION AND THE EFFECT OF HEAT UPON THEIR NUMBER.

By H. C. CAMPBELL, V.M.D., M.D.

Pathological Division, Bureau of Animal Industry.[1]

The Composition and Characteristics of Cow's Milk.

Milk contains all the food elements necessary for the development of the young. Not only do these food elements vary as to their percentages in the milk of individuals belonging to any one species, but the variations are still greater between different species. At first thought it may seem easy to give a statement concerning the composition of average cow's milk, but if one studies the subject it will be found that many factors come into play which render it very difficult to determine just what average milk is.

The average chemical composition of cow's milk may be stated to be about as follows: Water, 87 per cent.; fat, 3·9 per cent.; casein, 2·7 per cent.; albumin, 0·7 per cent.; sugar, 5 per cent. Milk also contains cellular elements, the number in normal milk usually not exceeding 500,000 per cubic centimetre.

Just as the chemical constituents have been found to vary according to the period of lactation, health, and breed of the animal, so has the number of cellular elements been found to vary. There is no definite standard of normal milk as to its chemical, physical, and physiological characteristics. In consequence of this the exact line of demarcation between the physiologic and pathologic properties of milk is an arbitrary one and determinable only by careful study.

At the beginning of the first week of lactation cow's milk contains two kinds of cells—colostrum corpuscles and leucocytes. The former are recognized under the microscope by their size and granulations; the latter correspond in morphology to the polymorphonuclear cells of human blood, and are always present in small numbers in normal milk. A third kind of cell, the epithelial cell, frequently gains entrance to the milk in the course of milking, being derived from the teats of the cow or from the hands of the milker.

The Presence of Leucocytes in Milk.

It has long been known that milk contains many bacteria and cellular elements. The relation existing between the kind of bacteria and the cellular elements has been a subject of considerable discussion in the last few years. Early observers found that the leucocytes and bacteria were invariably increased in the milk from a cow with udder inflammation. When milk contained a large number of bacteria and cells, it was thought that some one animal in a herd was suffering from garget or mammitis. Later observers contended that these cellular elements were found in normal milk, and that different animals and even different quarters of the udder in the same animal contained varying amounts of these elements.

[1] *Bulletin* 117.

The variety of bacteria commonly associated with an increase of leucocytes is the streptococcus. Whether the polymorphonuclear leucocyte is to be considered as a pus cell or a normal leucocyte is still an unsettled question. The early milk experts were inclined to consider the presence of large numbers of leucocytes as an indication of udder disease, the reason for this being that they found increased numbers of the streptococci also present. Some later observers—for instance, Savage—did not find this relation. Since normal milk contains leucocytes in varying numbers, it is the writer's opinion that they cannot be considered as pus cells unless they are present in large numbers, associated with pus-producing organisms. The mere presence of leucocytes in milk, therefore, does not seem to indicate pus formation in the udder.

Of the cellular elements found in milk the presence of leucocytes has excited the greatest interest among investigators, especially since Stokes conceived that the centrifugalized sediment containing more than ten leucocytes to a field of a $\frac{1}{12}$ oil-immersion lens indicates the presence of pus in the milk and consequently inflammatory processes of the udder. It is only natural that considerable significance was given to this finding, and since then various investigators have undertaken extensive examinations in order to determine the significance of these leucocytes in milk. The results of the findings of recent observers indicate that the presence of large numbers of leucocytes in milk is indicative of an inflammation of the udder, viz., streptococcic mastitis. Exceptions, of course, will be found where large numbers of leucocytes appear during the first portion of the lactation period and, as some observers contend, when milking is carried on until late in the period of gestation.

The demonstration of a mastitis by the presence of leucocytes would be of very great importance, as it is a well-known fact that such an affection cannot always be established by a clinical examination of the udder, especially in its early stages, and there are even instances when the affection might pass off without disclosing any clinical evidence of its existence. However, with the technique heretofore employed in the numerical determination of leucocytes, there is too narrow a margin between the leucocytes found in the milk of healthy cows and in that of diseased cows to make the majority of these methods of diagnosis satisfactory and practicable.

Various Methods for Determining the number of Leucocytes in Milk.

Different observers have advised various methods for estimating the number of leucocytes in milk in order to establish a standard by which it may be judged. While the several methods recommended are not directly comparable, it is nevertheless evident that an entire lack of harmony exists at present among them, and that the reliability of one or more of the methods is at least doubtful.

The first investigator to adopt a standard was Stokes, of the Maryland State Board of Health. The next was Stewart, of the City Board of Health of Philadelphia. Later Doane and Buckley, of the Maryland Agricultural Experiment Station, devised what is at present considered by many to be the most accurate and uniform method. A similar method was proposed independently by Savage. Many others

have done work along this line, bnt all have used modifications of the methods mentioned.

Three general methods are now in vogue, namely: (1) Smearing the sediment on a glass slide; (2) a volumetric method; and (3) a determination of the percentage of sediment in the milk. The first method in a general way involves the principles suggested by Stokes and Stewart; the second is that originated by Doane and Buckley and by Savage; aud the third method is that devised by Trommsdorff.

All of these methods for determining the number of leucocytes in milk have been used throughout this work, that of Doane and Buckley being slightly modified in some details, as is explained later on. A brief description of the technique used in the methods mentioned follows:—

Stokes's Method.—This consists in placing 10 c.c. of milk in a glass tube, which is whirled in an ordinary centrifuge for ten minutes. The fat and supernatant liquid are then poured off, and one platinum loopful of the sediment is spread over an area of 1 square centimetre on a glass cover slip. This is stained with methylene blue for one minute, and mounted in either water or Canada balsam on a glass slide. Ten fields are counted with a $\frac{1}{12}$ oil-immersion lens, and the average count is taken as the number per field. It has been the custom of those using this method to regard the milk as unfit for use when the number of leucocytes exceeds ten per field.

Stewart's Method.—This method consists in placing 1 c.c. of milk in a small glass tube, stoppered at one end with a rubber plug. The tube is placed on a Stewart disk, with the stoppered end at the edge of the disk, and is centrifuged for ten minutes. The rubber plug is drawn out while the tube is held horizontally, and the sediment on the rubber plug is smeared over an area of 1 square centimeter on a glass cover slip. This is stained for one minute with methylene blue, and is mounted in either water or Canada balsam on a glass slide. Ten fields are counted with the $\frac{1}{12}$ oil-immersion lens and the average count is taken as the number per field. Those using this method are accustomed to regard the milk as unfit for use when the count exceeds twenty-three per field.

Trommsdorff's Method.—This requires the use of a specially constructed tube holding 10 c.c. and drawn out at the bottom into a fine calibre. The narrow part of the tube has twenty graduations, each one representing 0·01 per cent. of the sediment from 10 c.c. of milk. Ten cubic centimetres of milk are placed in the tube, which is whirled in an ordinary centrifuge for ten minutes. At the expiration of this time the tube is taken out and the percentage of sediment read directly from the tube. This method gives the percentage of sediment, but gives no information as to the substances of which it consists. Trommsdorff's method, however, appears to give satisfactory results in practice, and is supported by many investigators as a relatively reliable method for practical use in demonstrating pus in milk.

The Doane-Buckley Method.—This method consists in placing 10 c.c. of milk in a glass tube graduated in cubic centimetres. The tube is centrifuged for ten minutes, and then the fat and supernatant liquid are aspirated off down to the 1 c.c. mark. This remaining cubic centimetre is thoroughly mixed with a saturated alcoholic solution of methylene blue, and is stained for one minute. One drop of this

mixture is placed in a Thoma-Zeiss blood-counting apparatus and the number of leucocytes per cubic centimetre is determined. Those using this method consider the milk below standard when the number of cells exceeds 500,000 per cubic centimetre.

In the experiments here recorded, the writer found it better to aspirate off the fat and supernatant liquid down to the 5 or 6 c.c. mark, being careful not to allow the pipette to go below the surface of the liquid. The tube was then filled up to the 10 c.c. mark with distilled water and recentrifuged. This was repeated several times until the upper surface of the liquid was transparent, then the supernatant liquid was aspirated off down to the 1 c.c. mark. The 1 cubic centimetre of sediment remaining was thoroughly mixed, 1 drop of the sediment was placed in a blood-counting apparatus, and the number of leucocytes per cubic centimetre was estimated. The advantage of washing several times and of using no stain was that there were very few fat globules and no precipitate from the stain. With the other method these were frequently found to interfere with the making of an accurate count.

TABLE I.—DETERMINATION OF LEUCOCYTES AND BACTERIA IN MARKET MILK BY VARIOUS METHODS.

Number of sample	Number of Leucocytes			Sediment (Trommsdorff)	Number of bacteria	Streptococci	Kinds of bacteria found
	Stokes	Stewart	Doane-Buckley				
	Per field	Per field	Per c.c.	Per cent.	Per c.c.		
1	5·0	10·0	34,000	0·05	9,080	Present	*Staphylococcus albus, Bacillus mesentericus.*
2	4·0	5·0	32,000	·02	877	do.	*Staph. albus, S. aureus.*
3	2·0	2·0	48,000	·01	413	do.	*Staph. albus.*
4	10·0	5·0	64,000	·04	480	do.	*Sarcina alba.*
5	2·0	2·0	32,000	·02	21,000	do.	B. Class IV. (Chester, p. 155).
6	2·0	2·0	32,000	·02	7.500	do.	*Staph. albus, Sarcina pulmonum.*
7	2·0	2·0	120,000	·02	26,000	do.	*B. mesentericus, Mycobact. lactis.*
8	3·0	2·0	64,000	·02	116,000	do.	*Bact. luteum.*
9	3·0	2·0	65,000	·02	76,000	do.	*Staph. aureus.*
10	1·0	2·0	25,000	·02	4,596,000	do.	*Staph. albus.*
11	1·0	2·0	28,000	·01	304.000	do.	*Bact. lactis, B. limbatum.*
12	1·0	2·0	30,000	·03	3,200,000	do.	
13	2·0	2·0	34.000	·02	551,000	do.	*Mycobact. lactis.*
14	1·0	1·0	46,000	·02	64,000	do.	
15	·4	·8	7,000	·02	145,000	do.	*Staph. albus, Micrococcus luteus.*
16	1·0	1·0	34,000	·07	490,000	do.	
17	1·0	3·0	45,000	·03	260,000	do.	*Bact. rugosum, Bact. plicatum, Mic. albus, B. sub. flavus.*
18	·5	1·0	15,000	·02	30,000	do.	*B. circulans.*
19	2·0	2·0	38,000	·03	200,000	do.	*B. liquefaciens, B. pseudo-typhosus.*
20	5·0	7·0	125,000	·05	150,000	do.	*B. mesentericus vulgatus, Mic. acidi lactici, Bact. acidi lacti*

A Comparison of the Methods.—It seemed desirable that a comparison of the foregoing methods should be made. This was done, using the technique above described. In each case there was made a determination of the number of bacteria per cubic centimetre, and the various species of bacteria were identified. Milk from three different sources was examined, namely, (1) market milk; (2) milk from a cow in her first lactation period (the cow had been under observation for some time and was known to have no udder lesions); (3) milk from a

TABLE II.—DETERMINATION OF LEUCOCYTES AND BACTERIA IN MILK FROM COW IN FIRST LACTATION PERIOD.

Number of sample	Number of Leucocytes			Sediment (Tromms-dorff)	Number of bacteria	Kinds of bacteria found
	Stokes	Stewart	Doane-Buckley			
	Per field	Per field	Per c.c.	Per cent.	Per c.c.	
1	8·0	3·0	61,000	0·03	1,833	*Micrococcus orbiculatus, Mycobact. pseudo-diphtheria.*
2	1·0	3·0	19,000	·02	8,700	*Mic. orbiculatus, Mic. ovalis.*
3	1·0	1·0	19,000	·02	4,122	*Mic. orbiculatus, Mycobact. pseudo-diphtheria.*
4	·1	1·0	7,000	·01	3,700	*Bacillus liquefaciens, Mic. acidi lactici.*
5	1·0	5·0	8,000	·01	2,833	*Mic. acidi lactici.*
6	·8	4·0	9,000	·01	5,550	*Mycobact. pseudo-diphtheria.*
7	·5	3·0	2,000	·0	1,000	*Mic. luteus, Mic. acidi lactici.*
8	·5	1·0	4,000	·0	1,466	*Mic. ovalis, Mycobact. lactis.*
9	·5	2·0	5,000	·0	2,061	*Mycobact. lactis.*
10	1·0	7·0	3,000	·01	1,505	*Mic. acidi. lactici.*
11	1·5	7·0	10,000	·015	1,600	*Mycobact. lactis.*
12	·3	5·0	8,000	·01	733	*Bact. mycoides, Mic. lactis.*
13	·7	1·0	10,000	·01	811	*Mycobact. lactis.*
14	·6	1·0	12,000	·01	8,300	*Mic. luteus, Sarcina alba, Mic. acidi lactici.*
15	·4	7·0	7,000	·01	927	B. Class II. (Chester, p. 227), *Mic. acidi lactici.*
16	1·0	1·0	14,000	·01	7,000	*B. mesentericus, Sarcina lutea, Mic. acidi lactici*
17	1·0	1·0	16,000	·01	333	*B. mesentericus, Sarcina lactis.*
18	2·0	1·5	14,000	·02	10,000	*B. mesentericus.*
19	4·0	4·0	81,000	·02	672	*B. mesentericus, Mic. aerius, Mycobact. lactis.*
20	4·0	3·0	20,000	·02	16,000	*B. mesentericus. Mic. acidi lactici, Sarcina lactis*

cow with inflammation of the udder. The results are set forth below in tabular form. Table I. gives the results of examinations that were made of market milk.

These samples of market milk were bought from ordinary milk stores in Philadelphia. The various methods used in determining the leucocytes all showed a certain, although not a uniform, relationship; that is, when one ran high the others usually also showed a high count. Streptococci were found either on staining the sediment or on the agar plates in each of the twenty samples examined.

Table II. shows the results obtained from the examination of the milk from a young cow in her first lactation period. The cow had

been under observation for some time and was known to have no udder lesions.

The above samples of milk were taken in a careful manner from a cow at the experiment farm of the Pennsylvania State Live-stock Sanitary Board, in Delaware County. The cow's udder and the milker's hands were washed with a 1 per cent. solution of creolin, and wiped dry with sterile absorbent cotton. The milk was drawn directly from the udder into a sterile glass bottle, which was then plugged with sterile cotton and brought at once to the laboratory for examina-

TABLE III.—DETERMINATION OF LEUCOCYTES AND BACTERIA IN MILK FROM COW HAVING INFLAMMATION OF THE UDDER.

No. of sample	Number of Leucocytes.			Sediment (Tromms-dorff)	Number of bacteria	Kinds of bacteria found
	Stokes	Stewart	Doane-Buckley			
	Per field	Per field	Per c.c.	Per cent.	Per c.c.	
1	17	20	425,000	0·03	5,450	*Bacillus mesentericus*, *B. citreus*. *Mycobact. pseudo-diphtheria*, *Mycobact. lactis*.
2	3	5	80,000	·01	300,000	*B. mesentericus*, *Mycobact*, *pseudo-diphtheria*.
3	4	12	112,000	·01	9,666	B. Class II. (Chester, p. 227), *Strep. mirabilis*, *B. rubus*.
4	1	5	14,000	·005	350	*B. aerogenes*, *Mic. citreus*, *B. rubus*.
5	4	4	25,000	·005	1,000	*B. mesentericus*, B. Class II. (Chester, p. 227).
6	6	8	95,000	·005	500	*B. aerogenes*, *Mic. citreus*, *B. rubus*.
7	10	36	650,000	·03	8,200	*B. mesentericus*, *B. fluggei*. *Mycobact. lactis*.
8	50	60	720,000	·04	1.200	*Sarcina lutea*, *Mycobact. lactis*.
9	11	18	256,000	·01	6,300	*Sarcina lutea*, *Sarcina alba*.
10	13	19	142,000	·015	250,000	*Mic. acidi lactici*, *Sarcina lutea*, *B. columbarum*.
11	7	17	120,000	·015	9,000	Streptococci.
12	6	11	100,000	·01	2,000	*Mycobact. lactis*, *Sarcina lactis*.
13	13	16	136,000	·015	600	*B. javaniensis*, streptococci.
14	16	17	146,000	·015	9,000	Streptococci.
15	13	24	138,000	·02	800,	*B. rubus*, streptococci.
16	3	4	100,000	·01	5,200	*B. rubefaciens*, *Bact. acidi lacti*, streptococci.
17	6	4	78,000	·01	800	*B. rubus*, *Sarcina lutea*, strep-
	2	4	108,000	·01	166,400	tococci.
18	17	17	89,000	·01	3,300	Streptococci.
19						Streptococci.
20	11	11	78,000	·01	2,000	Saccharomyces streptococci.

tion. One sample was taken on every other day, excluding Sundays. In all of the samples the leucocytic count and the percentage of sediment were very low, considered with relation to the standard. No streptococci were found either in an examination of the sediment or on the agar plates.

Table III. shows milk examined in the same manner from a cow having inflammation of the udder.

The above samples were taken from a cow on the same farm and under the same precautions and in the same manner as observed in gathering the milk reported on in Table II.

This cow gave birth to a calf on May 23, 1908. Immediately following this, one quarter of the udder became inflamed and the secretion of milk from this quarter ceased. On June 25, when the first sample was taken for examination, this quarter had become atrophied

TABLE IV.—LEUCOCYTE CONTENT OF HEATED AND UNHEATED MILK FRESHLY DRAWN FROM COW, SHOWING VARIATION BETWEEN FOREMILK, MIDDLE MILK, AND STRIPPINGS.

Number of cow	Parts of same milking	Cellular Content of milk—		Percentage of increase or decrease
		Unheated	Heated to 70° C.	
		Per c. c.	Per c. c.	
800	Foremilk	316,000	2,800,000	+ 786
	Middle milk	440,000	4,000,000	+ 809
	Strippings	572,000	6,200,000	+ 990
800	Foremilk	1,800,000	11,500,000	+ 538
	Middle milk	1,600,000	7,200,000	+ 350
	Strippings	2,800,000	9,600,000	+ 242
708	Foremilk	16,000	45,000	+ 181
	Middle milk	37,000	112,000	+ 202
	Strippings	136,000	236,000	+ 73
800	Foremilk	4,400,000	6,800,000	+ 54
	Middle milk	2,000,000	3,200,000	+ 60
	Strippings	5,200,000	9,600,000	+ 84
708	Foremilk	80,000	1,200,000	+ 50
	Middle milk	280,000	488,000	+ 28
	Strippings	360,000	432,000	+ 20
800	Foremilk	20,480,000	8,400,000	— 59
	Middle milk	1,260,000	2,798,000	+ 122
	Strippings	2,880,000	3,456,000	+ 20
722	Foremilk	128,000	240,000	+ 87
	Middle milk	192,000	392,000	+ 104
	Strippings	660,000	1,180,000	+ 78
806	Foremilk	66,000	25,000	- 62
	Middle milk	30,000	42,000	+ 40
	Strippings	82,000	124,000	+ 51
720	Foremilk	92,000	288,000	+ 213
	Middle milk	80,000	340,000	+ 325
	Strippings	200,000	1,400,000	+ 600
797	Foremilk	160,000	236,000	+ 47
	Middle milk	288,000	597,000	+ 107
	Strippings	488,000	1,158,000	+ 137
797	Foremilk	60,000	156,000	+ 160
	Middle milk	187,000	210,000	+ 12
	Strippings	192,000	344,000	+ 78
761	Foremilk	67,000	240,000	+ 258
	Middle milk	96,000	136,000	+ 41
	Strippings	221,000	312,000	+ 41
716	Foremilk	60,000	176,000	+ 193
	Middle milk	42,000	128,000	+ 204
	Strippings	92,000	320,000	+ 247
718	Foremilk	448,000	1,300,000	+ 190
	Middle milk	310,000	608,000	+ 95
	Strippings	460,000	6,716,000	+ 1,360

and very hard. The samples were a mixture from the other three quarters. The majority of them showed an extremely large number of leucocytes. In 50 per cent. of the examinations streptococci were found either from the sediment or on the agar plates. There seems to

be no doubt that the cow's udder was infected with streptocccci. The table seems to show that there is some relation between the presence of streptococci and the number of leucocytes.

The writer has frequently observed that the streptococci which occur with large numbers of leucocytes are in narrow curved chains, and it appears that pathogenic streptococci are usually of this type. On the other hand, some forms of lactic-acid bacteria may be mistaken for small, short, and thick chains of streptococci. Therefore it appears

TABLE V.—LEUCOCYTE CONTENT OF HEATED AND UNHEATED MARKET MILK.

Number of sample	Number of Leucocytes in Milk		Percentage of increase	Number of sample	Number of Leucocytes in Milk		Percentage of increase
	Unheated	Heated to 70° C.			Unheated	Heated to 70° C.	
	Per c.c.	Per c. c.			Per c.c.	Per c.c.	
1	41,000	584,000	1,324	2	42,000	552,000	1,212
	102,000	592,000	480		56,000	506,000	803
	85,000	612,000	620		43,000	490,000	1,039
	64,000	632,000	887		38,000	510,000	1,241
	46,000	626,000	1,263		43,000	540,000	1,156
	70,000	600,000	757	3	50,000	256,000	412
	72,000	636,000	783		62,000	264,000	325
	42,000	608,000	1,347	4	70,000	1,600,000	2,185
	21,000	580,000	2,661		64,000	1,700,000	2,556
	96,000	608,000	533		78,000	1,600,000	2,938
	23,000	616,000	2,578		62,000	1,609,000	2,158
	58,000	604,000	941	5	120,000	312,000	160
	73,000	664,000	809		106,000	308,000	190
	60,000	648,000	980	6	96,000	272,000	183
	34,000	632,000	1,758		108,000	284,000	162
2	102,000	492,000	382		112,000	288,000	162
	74,000	500,000	575		136,000	262,000	92
	100,000	532,000	432	7	60,000	120,000	100
	90,000	512,000	468		32,000	118,000	268
	65,000	498,000	666		46,000	112,000	143
	60,000	488,000	700		58,000	118,000	103
	54,000	516,000	855	8	162,000	222,000	37
	45,000	496,000	1,002		161,000	216,000	34
	40,000	524,000	1,210		156,000	196,000	25
	51,000	504,000	888		164,000	200,000	21
	64,000	496,000	675				

that narrow, curved chains of streptococci occurring coincidently with large numbers of leucocytes should be regarded seriously and as evidence that the milk is unfit for consumption.

DETERMINATION OF LEUCOCYTES IN MILK AFTER HEATING.

During the progress of the work previously described, an article by H. L. Russell and Conrad Hoffman upon "The Effect of Heating upon the Determination of Leucocytes in Milk" appeared in the August, 1908, number of the *American Journal of Public Hygiene*. This paper called attention to the apparent increase in the number of leucocytes in milk following heating. It appeared to be desirable to repeat their work under different conditions. Accordingly the following experiments were made, the details of which are shown in

Tables IV. to IX. The Doane-Buckley method was used by Russell and Hoffman, whereas in our work the modification before described was employed.

In Milk Drawn Directly from Cow.—The first series of comparisons between heated and unheated milk were carried out with milk freshly drawn from the cows. In each instance the foremilk, middle milk, and strippings were studied. The sample was first examined raw; then it was heated to 70° C. and another count of leucocytes was made. The percentage of increase or decrease in the heated sample

TABLE VI. LEUCOCYTE CONTENT OF DUPLICATE SAMPLES OF UNHEATED AND HEATED MILK.

Number of sample	Unheated			Heated		
	First examination	Second examination	Variation	First examination	Second examination	Variation
	Number	Number	Per cent.	Number	Number	Per cent.
1	41,000	102,000	59·9	548,000	592,000	7·4
	85,000	64,000	24·7	612,000	632,000	3·1
	46,000	70,000	34·2	626,000	600,000	4·1
	72,000	42,000	41·6	636,000	608,000	4·4
	21,000	96,000	78·1	580,000	608,000	4·6
	23,000	58,000	60·1	616,000	604,000	1·9
	73,000	60,000	17·8	664,000	648,000	2·4
2	74,000	100,000	26·0	500,000	532,000	6·0
	90,000	65,000	27·7	512,000	498,000	3·9
	54,000	45,000	16·6	516,000	496,000	4·0
	40,000	51,000	21·5	524,000	504,000	3·9
	64,000	42,000	34·3	496,000	552,000	11·3
	56,000	43,000	23·2	506,000	490,000	3·2
	38,000	43,000	17·6	510,000	540,000	5·8
3	50,000	62,000	19·3	256,000	264,000	3·0
4	70,000	64,000	8·5	1,600,000	1,700,000	5·8
	78,000	62,000	20·5	1,600,000	1,400,000	12·5
5	120,000	106,000	11·6	312,000	308,000	1·2
6	96,000	108,000	11·1	272,000	284,000	4·1
	112,000	136,000	17·6	288,000	262,000	9·0
7	60,000	32,000	46.6	120,000	118,000	1·6
	46,000	58,000	20·6	112,000	118,000	5·0
8	162,000	161,000	·6	222,000	216,000	2·2
	156,000	164,000	4·8	196,000	200,000	2·0

* The smaller number is used as the basis in each case.

is shown in the last column of Table IV., which gives the results in detail.

In the forty-two samples here reported, forty show that a much larger number of cells was found in the heated samples than in the unheated, while only two showed a decrease. The figures seem to indicate that heating causes a large increase in the number of leucocytes found on examination. The reason for this condition Dr. Russell explains in the following manner: "When milk is heated for ten minutes at 60° C. the creaming power is greatly diminished. The fat-globule clusters are broken down, and the butterfat is more or less homogeneously distributed throughout the milk serum. These fat-

globule aggregations rise steadily to the surface and probably entangle a good many of the cell elements; but with the more homogeneous emulsion of the fat due to the action of the heat the leucocytes are probably not enmeshed, and are therefore free to respond to the action of gravity."

The writer concurs in this explanation, since from the very nature of the leucocyte cell there can be no multiplication of these cells and therefore no actual increase in the number of leucocytes. A larger number is found in heated than in unheated milk, because they more freely settle with the sediment as a result of becoming disentangled from the fat globules, due to the effect of the heat. In unheated milk, on the other hand, only a comparatively small proportion of the leucocytes settle with the sediment.

In Single Samples of Market Milk.—The next table (Table V.) shows a number of counts made from single samples of market milk. In each case a number of subsamples were examined, but only one

TABLE VII.—LEUCOCYTE CONTENT OF MILK AT DIFFERENT TEMPERATURES.

Number of samples	15° C.	30° C.	40° C.	50° C.	60° C.	70° C.	80° C.	90° C.	100° C. for five minutes
	Per c.c.	Per c.c.	Per c.c.	Per c.c.	Per c.c.	Per c.c.	Per c.c.	Per c.c.	Per c.c.
1	70,000	80,000	140,000	158,000	1,200,000	1,600,000	1,600,000	—	—
	64,000	92,000	148,000	120,000	1,096,000	1,700,000	1,440,000	—	—
	78,000	84,000	144,000	154,000	1,120,000	1,600,000	1,640,000	—	—
	62,000	58,000	132,000	150,000	1,056,000	1,400,000	1,560,000	—	—
2	60,000	40,000	76,000	128,000	184,000	196,000	198,000	576,000	920,000
	48,000	32,000	100,000	132,000	176,000	194,000	200,000	592,000	900,000
	36,000	38,000	104,000	140,000	204,000	204,000	192,000	600,000	980,000
	40,000	46,000	108,000	164,000	188,000	208,000	196,000	630,000	1,000,000
3	144,000	136,000	132,000	140,000	184,000	256,000	704,000	724,000	900,000
	124,000	112,000	104,000	146,000	180,000	258,000	640,000	716,000	1,086,000
	106,000	124,000	128,000	144,000	186,000	260,000	716,000	680,000	946,000
	104,000	116,000	114,000	146,000	188,000	244,000	648,000	728,000	1,216,000
4	36,000	26,000	42,000	126,000	140,000	170,000	356,000	660,000	600,000
	38,000	36,000	56,000	130,000	148,000	154,000	368,000	580,000	610,000
	18,000	44,000	78,000	120,000	139,000	158,000	360,000	670,000	630,000
	42,000	28,000	60,000	124,000	145,000	144,000	380,000	590,000	650,000

count was made from a given tube. For each count throughout all the work shown in this table a new tube was taken, centrifuged, and examined.

In this, as in Table IV., the heated sample in every case shows a marked increase in the number of leucocytes, and in many cases the increases are large.

In Duplicate Samples of Milk.—In the next table the results of the examination of a number of duplicate samples are shown. A study of this table shows that the analytical error is much smaller in samples heated to 70° C. than in unheated samples.

Of the twenty-four duplicate samples examined, unheated and heated, the average variation in the unheated was 27·1 per cent., as compared with only 4·2 per cent. in the heated samples. These figures would seem to indicate that in routine inspection of milk one should heat the milk to somewhere near 70° C. before making an examination for leucocytes.

Number in Milk Heated to Varying Temperatures.—After noting the above results a number of samples were examined at different temperatures, in order to observe at what point the change in the apparent leucocytic content occurred. The results are set forth in Table VII.

The most satisfactory results were obtained between 60° and 70° C. There was an increase at 80°, 90°, and 100° C., but the results were not so uniform and the examination was much more difficult to make on account of the coagulated albumen, which interfered with the count. At the high temperatures the leucocytes were more or less disintegrated and could not be so easily differentiated from foreign material, hence the count was rendered less reliable.

Number in Milk After Pasteurizing and Cooling.—In pasteurized milk the leucocyte count is usually higher than in raw milk; therefore it was thought desirable to examine a series of four tubes from the same sample. The first tube was unheated; the second was heated to 70° C.; the third was heated and then cooled, and kept at 15° C. for twenty-four hours; the fourth was heated, then cooled, kept at 15° C. for twenty-four hours, and then heated again. The purpose of these experiments was to see if the milk after being pasteurized and cooled returned to the same condition as regards the number of leucocytes as that in which it was found before pasteurization.

TABLE VIII.—LEUCOCYTE CONTENT OF MILK BEFORE AND AFTER HEATING AND REHEATING.

Number of sample	First examination		Second examination (after cooling at 15° C. for twenty-four hours)	
	Unheated	Heated to 70° C.	Heated and cooled	Heated second time to 70° C.
	Per c.c.	Per c.c.	Per c.c.	Per c.c.
1	30,000	430,000	416,000	404,000
	19,000	428,000	424,000	412,000
	28,000	436,000	428,000	416,000
	26,000	432,000	360,000	422,000
2	260,000	380,000	452,000	348,000
	226,000	384,000	420,000	340,000
	208,000	380,000	440,000	346,000
	288,000	382,000	460,000	320,000
3	80,000	212,000	236,000	196,000
	60,000	204,000	228,000	204,000
	92,000	224,000	240,000	216,000
	76,000	222,000	208,000	200,000
4	60,000	248,000	214,000	268,000
	74,000	250,000	204,000	240,000
	78,000	240,000	216,000	264,000
	96,000	256,000	208,000	270,000

Table VIII. gives the results of these experiments, and indicates that there may be here a principle upon which may be based another method for determining whether milk has been heated or pasteurized.

The table shows that in every instance after the milk was once heated the cooling did not bring it back to its original condition,

while the second heating to 70° C. did not increase the count over the first heating.

Determinations by Various Methods.—The writer's modification of the Doane-Buckley method, which was considered the most accurate, was the only one used in the routine determinations of the number of leucocytes found in heated milk, as reported in Tables IV. to VIII., inclusive. For the sake of comparison, therefore, a number of samples were examined in similar manner by the other methods—namely, those of Stokes, Stewart, and Trommsdorff. The results which are shown in Table IX. indicate that there are also more leucocytes found in heated milk than in unheated milk by each of these methods of determination.

TABLE IX.—LEUCOCYTE CONTENT OF HEATED AND UNHEATED MILK, AS DETERMINED BY STOKES, STEWART, AND TROMMSDORFF METHODS.

Number of sample	Milk Unheated			Milk Heated to 70° C.		
	Stokes	Stewart	Trommsdorff	Stokes	Stewart	Trommsdorff
	Number per field	Number per field	Per cent. sediment	Number per field	Number per field	Per cent. sediment
1	0·6	1·8	0·005	5·1	13	0·03
	·5	1·9	·005	10·1	12	·03
	·2	2·7	·005	8·0	7	·03
	·3	1·0	·005	4·0	10	·03
2	3·3	13·0	·02	6·0	24	·03
	3·5	14·0	·02	15·0	22	·03
	3·7	9·0	·02	8·0	15	·03
	1·8	10·0	·02	12·0	12	·03
3	·3	1·5	·01	3·0	6	·02
	·2	·5	·01	2·7	4	·02
	·1	1·6	·01	4·3	8	·02
	1·0	1·0	·01	6·0	5	·02
4	·2	·1	·01	·4	3	·02
	·1	·15	·01	·5	2	·02
	·1	·2	·01	·3	6	·02
	·15	·1	·01	·6	4	·02

CONCLUSIONS.

(1) The effect of heating upon the number of leucocytes found in milk increased the number of leucocytes per field in Doane and Buckley's, Stokes's, and Stewart's methods, also the percentage of sediment in the Trommsdorff method, in all of the samples examined.

(2) It appears that heating is as essential as any other part of the technique in determining as nearly as possible the number of cellular elements in milk.

(3) Since heating greatly increases the number in the count of the leucocytes, it seems necessary that a higher leucocyte standard shall be adopted in judging milk.

(4) Milk inspection may be greatly benefited by the establishment of some rational standard for the leucocyte content of milk, but more study must be given to this subject in order to obtain the desired knowledge.

THE NEED FOR ORGANIZATION AND EDUCATION IN THE MEAT TRADE.

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THERE was a time, indeed, when the meat industry was better organized than it is even at the present day. That was the time when the trade guilds were in existence, but in the year 1835 these trade guilds were abolished, and with them the only organization in connection with the meat trade. These trade guilds had high privileges, and the members of the meat industry, who had their own guilds along with the other industries which existed in the various towns of the country, were really responsible for the election of the Town Councils. Our modern system, however, is totally different, and perhaps it is as well that it is so, as in these old times there is no doubt but that the guild privileges were abused. At the same time I may say that not so very long ago the members of the meat industry had no status at all. I think I am correct when I say that there is a statute existing in England, which enacts that no meat purveyor shall be allowed to sit on a jury where life is concerned, and they suffered other disabilities because of their calling. The abolition of the organization, therefore, in the year 1835, was a step backwards, and it was not rectified until comparatively recent years.

It was in the year 1888 that the Meat Traders' Federation came into existence, and since then it has done much to advance and protect the interest of all meat traders. At the present moment the number of members is something like 20,000, and a strong force in the country.

Few people realize what an enormous amount of money is invested in the meat industry, and how many countries rely upon British markets for outlets for their surplus meat products. Last year, for example, we imported nearly 600,000 tons of beef, mutton, and lamb, and it is estimated that our home supply amounted to 1,128,000 tons during the same period—figures which represent a gigantic amount of human industry, and also involve many millions of pounds in capital. It is, therefore, surely not an unreasonable proposition that a trade which has such great interests should be represented in the Parliament of the country.

Warranty.—One of the questions which the National Federation has had to consider is that of warranty. It has always seemed to me preposterous that the meat purveyor who goes into the market with his cash in his hand, and buys what is apparently a sound bullock, should have to lose the value of that bullock, or any part of it, if it should turn out to be diseased. It seems to me that the use of the tuberculin test would establish the fact whether such a bullock was sound or not, and the onus of ascertaining that fact should lie upon the farmer, as there is no ready means whatever of ascertaining whether a bullock is diseased or not when it is exposed in open market.

I do not mean to say that there is nothing to be said for the farmers' position, as it is quite within the knowledge of everyone here, I dare say, that many farmers are not breeders of their own stock,

but are simply feeders, and consequently they run the risk of purchasing stock which are diseased when handed over to them. At the same time, I do not see why such stock should not be subjected to the tuberculin test. Naturally, however, it will be asked who has to pay for such animals as are discovered to be diseased by the tuberculin test? And the answer to this is that such funds as are needed must be provided by the State.

Veterinary Department.—This leads me to say that I think the time has arrived for the establishment of a meat industry department in connection with the Board of Agriculture. There is very little understood about the meat industry by the Board of Agriculture at the present time. I mean by that, that it is not a specialized department as are others, and consequently suffers from want of attention. As I have already mentioned, the meat industry has vast interests, not only in this country, but in connection with the imports of foreign supplies, and there ought to be a Department of State instituted which wonld have the full control not only from the veterinary, but from the industrial point of view of the meat industry.

Public Abattoirs.—There is another section of the meat industry which, I think, may be administered in the same way, I mean public abattoirs. Such institutions are bound to become universal in the future, but it is a pity if the private slaughterhouse owner should be penalized and lose the power of his vested property and rights without compensation. Private slaughterhouses are in many cases constructed so as to meet every requirement of hygiene, but as a general principle it may be laid down that the control of the meat supply can be better carried out in public institutions, and I believe that the majority of the members of the meat trade are of opinion that public abattoirs would certainly lend themselves to easier veterinary inspection. The question therefore resolves itself entirely into compensation for the private slaughterhouses in existence. When you read the returns of the imported meats into this country from the British Colonies, Argentina, the United States, and many other countries, you will be apt to enquire if it is worth while putting down public abattoirs, considering that the home trade is threatened with extinction by reason of foreign competition. That, however, is a very wide question, which leads me to say that if foreign nations are able to send us meat supplies cheaper than we can produce these at home, it is because they have made it their business to acquire a thorough knowledge of the technique of the business, and they are thereby able to utilize the by-products to the very best advantage. Some of these nations have specialized meat products to such an extent that they obtain something like 100 different commodities from a bullock. As a consequence the principal articles of beef and mutton are bound to be rendered cheaper by the fact of the increased profits from these by-products. In this country there is no such development of the meat industry, and such by-products as I refer to are either inadequately dealt with or are wasted altogether.

This brings me to a matter in which I am personally much interested—namely, the question of technical education, and I do not see why there should not be organized courses of instruction for members of the meat trade. I can personally testify to the fact that where such courses of instruction have been offered, such as in the City of Edinburgh, they have been taken advantage of with the greatest

possible enthusiasm, and I am certain that if the National Federation were to devote itself to the organization of courses of instruction throughout the country, they would confer a lasting benefit on the trade. The meat trader requires to be educated up to his business—I mean the technique of his business—as nowadays he must be not only a meat purveyor, but a little bit of a veterinary surgeon; he must also be something of a chemist and a bacteriologist, if he would understand thoroughly his business, and such understanding would put him in such a position that he would be able to utilize his by-products to the best advantage. The outlook, indeed, is such that closer organization and higher education are both needed in connection with the meat industry, and both of these things will bring great rewards, not only to the individuals themselves, but to the country at large.

Reviews.

PATHOLOGIE CHIRURGICALE DE L'APPAREIL DIGESTIF (Surgical Pathology of the Digestive Apparatus). By C. Cadéac, Professor at the Lyons Veterinary School. 1 vol., 520 pp. 186 figures in the text.

This handy little book is published by J. B. Baillière et fils, 19, Rue Hautefeuille, Paris. It is one of a series which Professor Cadéac has produced in his "Encyclopédie Vétérinaire," the others including the surgical pathology of the foot, skin, blood-vessels and lymphatics, tendons, muscles, nerves, and articulations.

The ailments of the mouth, pharynx, œsophagus, stomach, and intestine are dealt with, and in many cases illustrated. Horses, bovines, sheep, and pigs each have their general and special defects and ailments in the mouth and throat region. The study of dental complaints comprises not less than 100 pages. The terrible ravages of epithelioma affecting the roof of a horse's mouth is an interesting illustration, so also are those representing tympanites of the guttural pouches and harelip in the dog, before and after operation (Hobday).

There is no work which veterinarians have resented so much being deprived of as a treatise on the surgical pathology of the domesticated animals.

M. Cadéac has been collecting material for the last ten years, and has made a reasoned synthesis of it. He studies each organ in a chapter comprising in its turn a series of articles showing the types of alteration that this organ may undergo.

The order of classification of all complaints is the anatomical order.

The domestic animals differ from an anatomical point of view, and there are correlative differences in their pathology. Each species of animal has its illnesses. It was urgent to have a pathology for each animal. M. Cadéac's classification admits of dividing, characterizing, and differentiating the pathologies, and shows the relationship that exists among them.

The work is illustrated with numerous figures, which add to the

clearness of the descriptive text. The book is tastefully bound with a little bit of that French *chic* and *distingué* appearance that adds to the appearance of volumes.—G.M.

PATHOLOGIE CHIRURGICALE DES ARTICUATIONS. By C. Cadéac, Professor de clinique a l'école vétérinaire de Lyon. Published by Baillière et Fils, 19 rue Hautefeuille, Paris. Price 12 fr.

As far as we know this is the only veterinary work which deals entirely with the numerous affections to which the articulations of the domesticated animals are liable.

Text-books on general surgery cannot adequately deal with what may be regarded as special branches, without being enlarged to an inordinate size, and need for specialization is one that is evident to all.

Professor Cadéac's present contribution will at least help to fill in one serious blank. This work contains 442 pages of matter with 142 illustrations. We trust that the time is not far distant when English translations of it will be obtainable.

The various forms of arthritis are concisely treated, and, as is true of many other French works, in a manner easily understood by anyone possessing even a slight acquaintance with that language.

On page 257, Cadéac, in referring to arthritis of the hock, says "the hock is the predilection seat of all forms of arthritis. Those cases not caused by traumatic influences are localized by work and fatigue." Following this statement we find forty-eight pages dealing with hock affections. The author recognizes all the common agencies regarded as predisposing factors to hock disease, and also describes the ones which are generally held to be exciting causes. Among the latter, however, some may be inclined to think that rather too much stress has been laid on the part played by micro-organisms in joint disease. In the above-mentioned article the following will be found: "he who says arthritis, says infection of a joint or the intervention of toxins which alight there."

Most of us have not been in the habit of regarding all cases of osteo-arthritis of the hock as being due to the activity of micro-organisms, and, although we know that many hock affections are caused by bacteria, or are complicated by them, we feel that perhaps Professor Cadéac is a little too enthusiastic in the support of his suggestion.

However, no one who reads the book will be disappointed. It is concise, full of interesting matter, and inexpensive.—M.J.

Miscellaneous.

UNIVERSITY OF LONDON.

FACULTY OF SCIENCE (VETERINARY SCIENCE). GENERAL INTERMEDIATE EXAMINATION (PART I.) FOR INTERNAL STUDENTS.

PASS LIST, JANUARY, 1910.

101. Horton, Frank Fielding, Royal Veterinary College.

Examiners: Organic Chemistry: A. W. Crossley, W. P. Wynne, A. McKenzie, J. Wilson. Veterinary Anatomy: O. C. Bradley, E. S. Shave. Biology: J. G. Kerr, W. H. Lang, F. W. Oliver, W. G. Ridewood, F. Buchanan, F. E. Fritsch, D. T. Gwynne Vaughan, H. W. Unthank.

THE VICTORIA UNIVERSITY OF MANCHESTER.

EXAMINATION RESULTS, MARCH, 1910.

THE following gentlemen have obtained the Diploma in Veterinary State Medicine:—

Henderson, W. W., M.R.C.V.S.
Holroyd, John, M.R.C.V.S.
Mattinson, A. B., M.R.C.V.S.
De Vine, Brennan, F.R.C.V.S.

Translations.

CRIB-BITING IN RUMINANTS.

BY STAFF VETERINARY-SURGEON KULL.

IN general crib-biting is only noticed in the horse, ass, and mule tribe, and is considered more or less injurious to them. In the law-book of this country it is entered as an unsoundness. Crib-biting in ruminants has seldom been noticed, and on that account the following case may be of interest:—

During the last manœuvres I watered my horse during a critical pause at a small isolated homestead in the Schwetz district. The well was situated near the entrance to a cow-house, and during a pause in the pumping I heard a distinct crib-biting noise in the standing. I went in expecting to see a crib-biting horse, but was much astonished to find only three cows. One of them—roan and rather thin—cribbed by drawing down the bottom jaw and at the same time putting out her tongue on the anterior edge of the manger. The sound which the swallowing down of air caused resembled exactly that produced by a bad crib-biter. The owner told me the cow was seven years old; that he himself had bred her, and that the defect had considerably increased during the last two years. As the cow had given little milk for some months, and kept getting thinner, the owner wanted to sell her.

This case shows that crib-biting not only may occur in cattle, but that it may become a very pronounced unsoundness.

(*Zeitschrift für Veterinärkunde.*)

SCOPOLAMINE AND ITS ACTION AS AN ADJUVANT IN CHLOROFORM ANÆSTHESIA.

BY GEORGE M. ILIESCO.

Principal of the Veterinary College at Bucharest.

SCOPOLAMINE is an alkaloid found in the root of the plant *Scopolia japonica*, in the seeds of *Hyoscyamus niger* and of *Datura stramonium*, in the leaves of *Duboisia*, and in small quantity in the root of *Atropa belladonna.*

According to Lademburg, scopolamine, hyoscine and atropine are three identical substances, having all the formula $C_{17}H_{23}NO_3$.

Scopolamine was isolated by Schmidt in 1892, and later was studied by Pawloff, Claussen, and the pupils of Kobert, who found that this alkaloid exercises a sedative action on man.

According to Guauck, Claussen, Sorkt, Wood, and Ernst, scopolamine produces somnolence in man ten to twelve minutes after its administration.

Ernst showed that large doses produced excitement in the dog, and that this alkaloid is relatively little toxic for warm-blooded animals.

Paukul advises injections of bromhydrate of scopolamine to revive animals in chloroformic syncope.

Schneiderlin recommends scopolamine, associated with morphine, in the form of subcutaneous injections to produce sleep.

In 1897 De Stella made a detailed experimental study with this substance. He found that cold-blooded animals (such as frogs) resisted considerable doses, the fatal dose being $\frac{1}{200}$ of its weight. The dog is killed by 0·66 grm. per kilo of its live weight, whilst the rabbit resists much stronger doses: 1 grm. per kilogramme of the live weight. In frogs small doses do not accelerate the heart-beats; toxic doses produce paralysis of the heart. In the dog small doses cause acceleration of the heart and increase blood-pressure-phenomena accentuated by increasing the quantity given; whilst big doses produce contrary effects.

Scopolamine diminishes salivary secretion in the dog, biliary secretion in the rabbit, and diminishes the quantity of urine in the two species; its employment is therefore dangerous in renal affections.

In 1899 Bourgon made a communication to the Biological Society relative to a case of idiosyncrasy to scopolamine. He recommends this alkaloid, however, as a very important mydriatic, especially where there is a tendency to glaucoma.

Another important study on scopolamine has been made by Kochman at the laboratory of Jena, and his results agree with those of De Stella. Towards the end of 1905 Kouffart and Walravens published a work on "The Employment of Scopolamine as a General Anæsthetic in Surgery," in which they affirm that the principal quality of this special narcosis is to much reduce the quantity of chloroform administered.

Laurendeau, from the good results he had obtained, advised the employment of scopolamine in obstetrics.

Challet observed hypnotic and sedative effects in mental maladies.

In 1906 Professor Dupuis, helped by his assistant Van den

Eeckhout, observing certain successes obtained in human medicine by employment of this alkaloid, carried his observations further to the large domestic animals.

They discovered in their researches that scopolamine constitutes a valuable help in anæsthesia by chloroform, and that this mixed method, "scopolamine, *plus* chloroform" has advantages which no no other method possesses.

Comparing anæsthesia by chloroform alone, with that by chloroform *plus* scopolamine, we found:—

(1) The period of initial excitement produced by chloroform when administered alone, which may be long, violent, and often dangerous, is almost suppressed by the employment of scopolamine.

(2) The quantity of chloroform employed in the mixed method of chloroform *plus* scopolamine is smaller than in the case of anæsthesia by simple chloroform.

(3) The time occupied is shorter with mixed anæsthesia than chloroform alone, and the recovery of the animal more rapid.

Thirty experiments were made, and the scopolamine was administered intravenously, but it may be equally as well used subcutaneously. For these injections the solutions may be made in distilled water. For intravenous injections Locke's liquid (without glucose) has been used as the vehicle. The solutions may be made in the proportion of 1 in 200, 1 in 100, and even 1 in 50.

The dose employed varies according to the weight and temperament of the animal. The effects may be obtained by weak doses, $\frac{1}{10}$ milligramme suffices for the frog, and for the dog and horse 2 to 6 milligrammes per kilogramme of the body weight. All causes which diminish the quantity of chloroform necessary to produce anæsthesia lessen danger of cardiac syncope. Cardiac syncope has been attributed to excitation of the pneumogastric nerve or its bulbar nucleus by chloroform. It is said that by paralysing the pneumogastric scopolamine prevents syncope, but this we doubt.

CONCLUSIONS.

(1) Scopolamine accelerates the heart-beats, augments blood-pressure, increases respiratory movements. It modifies the peripheral nervous system, suppressing the pneumogastric in the dog and moderating its action in the rabbit. One does not observe any appreciable modification of the sympathetic; it has no action on the depressor nerve. It increases the excitability of the nervous centres at first, and depresses them afterwards.

(2) Scopolamine is an important auxiliary in chloroform anæsthesia, this effect being obtained in a shorter time and with less chloroform.

(3) This action of scopolamine is due to two modifications on the system: (*a*) On the central nervous system; (*b*) on the circulation and respiration.

(4) Fatigue affects anæsthesia by chloroform in the same way and by the same mechanism as scopolamine.

(5) The quantity of chloroform employed being much reduced, the cerebral troubles produced disappear rapidly, the animal wakes quickly, and sensibility is rapidly re-established. Only dilatation of the pupil remains for twenty-four hours, and sometimes longer.

(6) Scopolamine prevents cardiac syncope, not by paralysing the

pneumogastric but by reducing the quantity of chloroform employed; one thus avoids heart intoxication.

(7) Mixed anæsthesia by chloroform *plus* scopolamine is recommended on one condition only; one must not push anæsthesia too far, for respiratory syncope once produced, the heart being very accelerated under scopolamine, the oxygen of the blood is rapidly consumed, and the animal dies more quickly than in the case of anæsthesia without scopolamine.

(*Arhiva Veterinaria.*)

LACERATION OF THE MASTOIDO-HUMERALIS AND OF THE ŒSOPHAGUS IN A HORSE.

By B. GERMANI.

The horse, Mercury, when seen one evening, showed the following symptoms: Refusing food and drink; in the morning there was slight tumefaction between the middle and lower third of the inferior region of the neck. Tumefaction increased rapidly, and at the time of the visit the swelling extended from the larynx to the entrance of the chest, and rose up laterally to the jugular furrows. Besides, the animal presented some general symptoms: head extended, coat upstanding, muscular tremors shown, gait uncertain. Temperature 39·4° C.; mucosæ injected. The tumefied region was hot and tender; the skin bore no trace of contusions; there was certainly a traumatic lesion, but exploration of the deep organs was impossible on account of the swelling.

Scarifications, followed by the application of warm antiseptic compresses, were practised in the tumefied region, and gave exit to an abundance of citron-coloured liquid. The œdema, which had diminished at first, rapidly increased in the evening, and asphyxia threatening, tracheotomy was performed. The animal died on the evening of the following day. At the autopsy, besides œdematous infiltration of the whole tumefied region, there was an interesting rent in the mastoido-humeralis muscle, involving two-thirds of its extent, situated between the middle and inferior third of the neck. At this level there was a large pocket the size of a nut containing a blackish, hæmorrhagic mass in which a mixture of putrefied alimentary *débris* was found. The œsophagus had an elliptical rent with fringed borders, the muscular tunic friable and gangrenous, the mucosa not notably altered. The connective tissue around the œsophagus was infiltrated with blood and contained alimentary particles.

The cause of the lesions was supposed to have been the bite of a neighbouring horse, which had been inflicted when the muscle was contracted, and whilst the œsophagus was traversed by an alimentary bolus.

(*La Clinica Veterinaria.*)

APPLICATION OF BIER'S METHOD IN TWO CASES OF TRAUMATIC ARTHRITIS,

BY MEYRAUX AND LANCELEUR.

THE authors tried passive hyperæmia by venous stasis in two extremely grave cases of arthritis, which ended in cure in one case and slaughter in the other. The first case was interesting. Instead of slaughtering the wounded animal at once, which had an open hock and fetlock joint, due to wounds in embarkation, the authors tried Bier's method. They applied a linen bandage 0·05 metre in width and 3 metres long above the hock, moderating compression, but enough for the finger to pass easily between the skin and the bandage. This was left in place from 7 to 11 o'clock in the morning, and from 3 to 9 o'clock in the evening for eight days. The wounds were not treated.

On the morning of the third day they were surprised to find pain much less.

The synovial discharge rapidly diminished and was dried up seven days after entrance of the sick horse into the infirmary. There remained only two large benign, granulating wounds, which were treated ordinarily.

(*Revue Générale de Médecine Vétérinaire.*)

AN INTERESTING CASE OF ANTHRAX IN THE COW.

BY DR. OPPERMANN.

Wanzleben.

IN May I was called to a cow suddenly taken ill. As I could not get to the animal until two hours afterwards, I found her necessarily slaughtered. The owner told me that the cow in question was 6 years old, well nourished, had eaten well the evening before, and given her accustomed quantity of milk; on the following morning she had refused food, and only given a litre of milk; patient was then slightly blown up and weak. The temperature taken by the owner at the time was 38·5° C. The advancing weakness of the cow and the loud moaning led to the belief that the illness was due to a foreign body, and she was therefore slaughtered. Hæmorrhages from the natural openings of the body or swellings were not observed.

The *post mortem* showed flesh well bled. Blood dark red, clotting badly. No changes on the subcutaneous tissue. Under the endocardium of the left ventricle numerous hæmorrhages as large as a penny piece. Lungs well retracted, dark rosy red. Liver hard as a board from distoma invasion. Edges of the spleen slightly rounded. Spleen scarcely enlarged, brownish red, pulp browny red, not liquescent. Kidneys dark brownish red. Intestinal glands swollen and greyish white. Under the duonenal mucous membrane numerous hæmorrhages of small size and punctiform. Lymphatic glands slightly swollen and sodden, and partly studded with punctiform hæmorrhages. The submucosa of the abomasum was disintegrated, gelatinous, and swollen in some places to 4 cm.; the jelly-like parts showed streaky hæmorrhages.

I took a piece of spleen, kidney, and mucous membrane of the abomasum home, and by bacterioscopic coloration with safranin found numerous typical anthrax bacilli in all three specimens. Macroscopically the case might have been taken for one of septic inflammation of the stomach, which is not uncommon in cattle.

This case shows, however, that a certain diagnosis is only possible by microscopic examination; had such not been undertaken, the flesh as well as the skin would have been used, and disinfection of stall, slaughter place, and instruments neglected.

(*Deutsche Tierärztliche Wochenschrift.*)

A CASE OF OSTEOMALACIA IN THE HORSE.

By Chief Veterinary-Surgeon Dr. SUSTMANN.

Dresden.

A SERVICE horse, aged 8, which had previously been a bad doer, fell under notice for about a month on account of languor and listless gait. His condition was poor. In spite of careful and repeated examination, a result of positive value could not be established. Opportunity for grazing was present, and the horse was turned out several hours daily. He was seldom worked, and then only lightly.

After such an event he one day suddenly, without any warning, showed bleeding from the nose and tears from the eyes. A general examination was again negative. On percussion of the cavities of the head, the upper maxillary sinus on the right side gave a hollow sound. At the same time, the thin, bony plate began to bulge. Trepanation of the cavity revealed nothing special; but the tears ceased and the wound had almost healed in four weeks.

Ophthalmo reaction for the diagnosis of tuberculosis, was without reaction. Microscopic examination of the blood (staining with Ehrlich's triacid solution), as far as its corpuscular elements were concerned, only showed this deviation from the normal, namely, that the leucocytes showed exclusively the polynuclear form.

About six weeks after trepanation, bulging of the frontal bone occurred, and over the frontal sinus on the right side there was a swelling as big as a walnut. Osteomalacia was now diagnosed, and corresponding treatment adopted. Suitable and varied food of every kind was now given, and a mixture of phosphate of lime (a teaspoonful in in each feed), together with rest and exercise, prescribed.

About nine months from the commencement of the illness the horse was ridden out for trial for half an hour. When brought back and put in the box he could not stand, even when supported. As no improvement occurred he was killed.

The *post mortem* showed typical osteomalacia. The upper jaw, breastbone, and ribs could easily be cut through with a knife. The external layer of the bone was covered at certain places with red punctæ, and the bone-marrow was red and partly fluid. The cartilages of the joints showed more or less violet or bluish tinge. The other bones were still hard, but showed single punctiform hæmorrhages on the sawn surface.

(*Zeitschrift für Veterinärkunde.*)

INTRODUCTION OF GLANDERS THROUGH ENGLISH HORSES.

BY DR. STÖDTER.

OF twenty-nine English horses imported into Denmark some time ago, seven were found to be affected with glanders soon after arrival. This cannot be wondered at when we hear what the first veterinary authority in England, Sir John McFadyean, reports in the *Journal of Comparative Pathology and Therapeutics* (vol. xviii., p. 23): In the year 1892 there were 3,001 cases in Great Britain; in 1898, or six years later, 1,472, and in 1904 no fewer than 2,658 cases. Glanders has spread all over Great Britain in consequence of insufficient veterinary police regulations. Most cases are to be found in London, Liverpool, Manchester, Birmingham, and Glasgow. It is important to note that the greater number of these cases were clinically recognizable. McFadyean accepts that about 1,000 other horses in Great Britain are affected with occult glanders—truly a sorrowful picture! One must strongly agree with Bang when he says that the purchase of English horses, especially such as are used in London, is an extremely dangerous thing, when considered from the point of view of veterinary police. Let us hope that the English Glanders and Farcy Order, soon to come into force, will effect a change.

(*Maanidschrift for Dyrlaeger.*)

PIROPLASMOSIS IN DOGS.

BY CHIEF VETERINARY-SURGEON STAHN.

A FOX-TERRIER bitch, aged 4, belonging to a breeder, fell ill with catarrh of the stomach and intestines, but was not feverish. On the following day her condition had improved; but a three-months-old dog of the same breed showed the following symptoms of illness: Pronounced yellow colour of the visible mucous membranes and skin, especially on the belly and internal surfaces of the thighs; lassitude and weakness of the hind-quarters, decline of appetite. The greatly strengthened heart-beat was not evident; but, on the other hand, the pulse was weak. A feverish rise of temperature was absent. The urine was coloured reddish-yellow to yellowish-brown.

After the introduction of the illness a few weeks elapsed, and then two dogs of a like age died in a few days exhibiting the same symptoms of illness. Veterinary treatment of the patients was not undertaken, nor was a *post mortem* made, the owner considering the illness a simple gastro-intestinal disease.

In view of a short notice in the departmental press on the occurrence of piroplasmosis in dogs, I took some sterile blood from an aural vein with the object of examining it for blood parasites. Staining by Giemsa's method gave negative results (a short time previously examination for *Piroplasma bigeminum* was also without result). On the contrary, staining with carbol-fuchsin clearly showed piroplasms in different red blood corpuscles. They were approximately round in form, and lay chiefly in twos and fours in a blood corpuscle.

The four-year-old bitch above mentioned showed marked icterus on the third day of the illness. I was afterwards informed that the bitch frequently lay on the roof of the kennel in which the sick young dogs lived. Two other inmates of a kennel in the same yard remained free

from illness. The symptoms of illness disappeared in both dogs in eight days under treatment with liquor potassæ arsenitis. Further illnesses have not occurred since (October 22, 1909). Three days after the arsenical treatment I examined the urine of a patient and found it straw-coloured, clear, and limpid, and free from bile pigment, albumin, hæmoglobin, and red blood corpuscles.

(*Zeitschrift für Veterinärkunde*).

New Instruments and Appliances.

NEW MOLAR TOOTH FORCEPS.

SUGGESTED BY A. R. ROUTLEDGE, F.R.C.V.S., LOUTH.

THE special features of these forceps are the open-ended wedge-shaped lever, which, when the forceps are applied, can be inserted (by reason of its shape) with the greatest ease.

The jaw ends are so set that they bite a normal molar from end to end (Santy's bite by the heel end only). Rounded jaw ends take up less room in the mouth, a great advantage in extracting sixth upper or lower molars. There is so little clearance that it has been my experience, in extracting the sixth lower or an abnormal seventh with Santy's, that, having thoroughly loosened the tooth, it has been impossible to fetch it out of socket without cutting in two, owing to the amount of room the Santy end takes.

The makers are Messrs. Arnold and Sons, West Smithfield, London, E.C.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; London University Gazette; The Representative (Dick College); A Handbook of Practical Parasitology, by Braun and Lühe (Bale, Sons and Danielsson, Ltd., London. 10s. 6d. net); Bulletin of The Bureau of Sleeping Sickness; The Rhodesian Agricultural Journal; The Commercial Motor.

Letters and Communications, &c.

Professol Schimmell; Dr. Stapley; Mr. A. Wilson; Mr. Bevan; Mr. G. H. Livesey; Mr. P. R. Thompson; Mr. Motton; Mr. Mayall; Board of Agriculture and Fisheries; Department of Agriculture and Technical Education for Ireland; Professor G. H. F. Nuttall.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the JOURNAL should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

THE LATE MR. W. A. BYRNE, M.R.C.V.S.

THE

VETERINARY JOURNAL

MAY, 1910.

W. A. BYRNE, M.R.C.V.S.

It is with extreme regret that his many friends will have heard of the death of Mr. W. A. Byrne, which occurred at his residence, Castle Strange, Roscommon, on April 17. For some months past Mr. Byrne was in failing health, and had undergone a serious operation, but his death was not so soon expected.

He was yet a young man, only 46 years, and was full of his usual vigour and spirits to the very last. Mr. Byrne was born in co. Roscommon, and received a high classical education. He went through the Agricultural Course at Glasnevin College, and qualified from the Royal Veterinary College, London, in 1889, where he was for some time House Surgeon and Demonstrator in Anatomy, afterwards going to practise in his native county, where he was highly esteemed and respected for his many splendid attributes.

Mr. Byrne took the greatest interest in all matters pertaining to the Veterinary profession, being a member of two Irish associations as well as of the National Veterinary Association. He was for some time a member of the Council of the Royal College, being elected in 1900, and also one of the Governors of the Royal Veterinary College of Ireland. He was one of the regular advisers of the Department of Agriculture in Ireland; one of his very last works was to confer with the Department on the proposed veterinary dispensary scheme for the congested districts. By

Mr. Byrne's death the world of sport has lost an enthusiastic supporter, and the Veterinary profession has lost one of its most able, brilliant, and popular members. His colleagues in Ireland particularly, will miss him, and his place in the ranks will not easily be filled.

Mr. Byrne was an all-round sportsman, a prominent figure in the hunting field, and his colours were often to the front on the Turf. He was a renowed and gifted orator. He took an active part in politics, was an ardent Home Ruler, and had always a deep interest in the welfare of the people. His kindness and generosity to the poor were proverbial, and made him beloved by all who knew him. His local popularity may to some extent be judged from the fact that the funeral cortège was over two miles long. His jovial, amiable manner made him always welcome; he was the best of company, few could equal his telling of a story.

Editorials.

THE STANDARDIZATION OF VETERINARY SERA.

It is really very remarkable what little has been done in the way of attempting to secure uniformity in that increasingly important class of therapeutical agents, such as antitetanic serum, tuberculin, mallein, &c. It is not that uniformity of dose of the finished preparation as sent out by the manufacturers is needed, but some guarantee that the dose shall contain a sufficiency of the essential ingredients required to produce their specific effects. There are many manufacturers of tuberculin and mallein. They can place their products on the market without any guarantee of their accuracy, and that being the case it is little to be wondered at that results of testing with these agents have frequently varied, with a natural loss of confidence in their reliability as testing agents. We fear that those agriculturists who distrust tuberculin have some grounds for their distrust, not of properly prepared tuberculin, but of inferior products. And how can they be distinguished at the present time? It would be a thousand pities that such useful agents should become despised, for if once they become regarded as being unreliable (owing to manufacturers

shortcomings or otherwise), it will be extremely difficult to restore confidence in the minds of the laymen in reference to them.

Then, again, with regard to antitetanic serum. We have frequently heard veterinary surgeons express doubts in no unmeasured terms as to its efficacy. Those doubts have arisen as the result of failure to obtain the specific action attributable to the serum. How can we account for these failures? The answer to this question is furnished in a very excellent paper on pp. 285 *et seq.* by Drs. Moller and Eichhorn. They have tested a number of marketed samples of antitetanic serum, and have found enormous variations in them. Taking the American unit as the standard for comparison, the immunizing dose being 1,500 American units, they found the necessary amount present in some manufacturers' products, but considerably less in others, while in one case there was actually less than one-third the required number of units to produce immunity.

Now these variations can only be remedied by enforcing a definite standard; the products should be guaranteed a definite strength, and any deficiency should be heavily penalized. Such steps are necessary for the welfare of our patients and clients. Moreover, as the investigators referred to say, "It is very essential that the veterinarian should have some assurance of the strength of the antitoxin upon which his standing as a professional man may depend. Under the present conditions the veterinary surgeon has no assurance of the potency of his serum, and is solely dependent on the reliability of the manufacturer."—G.H.W.

COLONIAL VETERINARY SCIENCE.

WE have at last received the somewhat delayed official report of Dr. Theiler's address, delivered at the opening of the session at the Royal Veterinary College of Ireland. The address, however, loses nothing by its delay, and is worthy of careful perusal by all concerned in veterinary education. It has special reference to the conditions under which disease exists and spreads in South Africa, and is certainly most interesting and instructive.

The reference to what is being done by Colonial Governments to assist research is very pleasing. Foreign governments realize

the necessity for substantial grants for this purpose; British Colonial Governments realize it, but England herself lags behind in a woeful fashion. This state of affairs cannot last long. We have often referred to this point, and do not wish to labour it unduly now, especially as we fancy we see a dim light appearing with a promise of something substantial being done in the near future. The Transvaal has built and equipped a laboratory exclusively for the study of animal diseases, at a cost of £80,000, and makes an annual grant of £30,000 towards its maintenance. Is it not time that Britain did a little more out of the National Exchequer instead of crippling research by relying so much on private enterprise?—G.H.W.

"THE BIOCHEMIC HOSPITAL!"

It affords us much satisfaction to give gratuitous and unsolicited publicity to this institution. We have recently received the undermentioned advertisement accompanied by a pamphlet of some twenty pages, setting forth in glowing terms the advantages to be obtained from the "Biochemic" treatment, and a tolerably modest life-history of the enterprising individuals who are responsible for this attractive institution.

STREATHAM BIOCHEMIC HOSPITAL AND HOME FOR HORSES, DOGS, CATS, AND BIRDS.

Inspection Invited. *Established in Streatham, April,* 1908.

In and Outdoor Patients attended by Biochemic Specialist.

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Animals and Birds taken in from 9 a.m. to 10 p.m. Sundays 9 to 1 o'clock. 147, 149, & 151, Eardley Rd., Mitcham Lane, Streatham. Booklet explaining Biochemic Treatment free on application.

It is astonishing how very easy the British public can be

induced to lend any support to such pretensions set forth in such a manner. Certain pages of the pamphlet are amazing, and our readers can, if they desire to take the trouble, obtain them by application, but the final page, which we quote here, shows that those responsible for the "Biochemic Healing System" are fully alive to the importance of adequate financial support. We read as follows:—

"NOTICE!"

"*The Biochemic Society at Streatham, London, S.W., was formed on 16th April*, 1908.

"Its purpose is:—

(1) To promote the knowledge and use of the Biochemic Healing System—

(*a*) By instruction at monthly meetings as to the proper course to adopt in good and ill health, and as to biochemic treatment of ordinary ailments which do not require the assistance of a biochemic doctor.

(*b*) By a Biochemic Periodical which will be sent regularly to the members free of charge.

(2) To protect Dogs, Cats, and Birds from torture and ill-usage by the experiments of the Allopathic operations, treatment in time of illness.

(3) The protection of stray dogs and—in every case possible—their restoration to their owners. Where the latter is not possible, owing to failure to find the owners, the dogs are cared for under the personal superintendence of their resident manager, pending the finding of a suitable home for them with kindly disposed lovers of animals. If injured or suffering from any ailment they are carefully attended to by the Biochemic Specialist, and they are not sent to any home until they are quite recovered. Every care is taken and enquiry made as to the selection of a home, and when satisfactory arrangements are made, the dog or cat is sent to its new master or mistress under the personal supervision of an experienced superintendent.

"Ladies and Gentlemen who sympathise with the above objects are respectfully invited to join the Biochemic Society.

"Subscription of Members:—£50 are eligible for election as Governors. £1 carries with it the right to recommend a patient. Members enrolled at the Offices of the Society—149, 151, Eardley Road, Streatham, London, S.W.

"Any further information post free, on application to the Hon. Secretary, at above address."

Here is an opportunity for any Member or Fellow of the Royal Veterinary College who feels that the curriculum and experience which have given him professional status and skill are inadequate for his practice, to subscribe his guineas to the society in Streatham and to sit at the feet of the pundits of Eardley Road, S.W., in order to acquire some of the notable lore referred to in their modest booklet. Or perhaps Parliament might be petitioned to accord to the professors of "biochemistry" that recognition which an unfeeling world at present withholds!

General Articles.

THE RELIEF OF ROARING IN HORSES BY EXCISION OF THE LEFT LARYNGEAL VENTRICLE.[1]

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.,
Professor in the Royal Veterinary College, London.

At the outset I should like to sound a note of warning concerning the usefulness of this operation. Roaring, in the broad sense, or the production of abnormal inspiratory sounds during forced exercise, may be due to a number of varied causes, and it is not suggested that all and sundry may be relieved by the operation about to be demonstrated. It would be quite useless in cases in which the sound is due to such mechanical obstructions in the air-passages as constrictions of the nostrils or posterior nares, cysts, or polypi, thickening of the pharyngeal and bronchial mucous membranes, and swellings of the guttural pouch. On the other hand, it is likely to be of great service in those cases of what I may term "true" roaring due to paralysis of the laryngeal muscles, which is usually unilateral, affecting the left side.

In order to understand how the desired results are to be brought about, it is first necessary for us to briefly refer to the structure of the larynx and its mechanism. It consists of a cartilaginous framework composed of five pieces, viz., cricoid cartilage, thyroid cartilage, epiglottis, all single and mesially placed, and two laterally placed arytenoid cartilages. They are all movable one upon the other by means of so-called intrinsic muscles, viz., crico-thyroideus, crico-arytenoideus posticus, crico-arytenoideus lateralis, thyro-arytenoideus, and the arytenoideus. The last-named is single and the rest in pairs. They are named according to their attachments, and thus it will be seen that all except the first-named are attached to the arytenoid cartilage and control its movements on its respective side. The vocal cords join the arytenoid cartilages with the thyroid, and they project obliquely into the larynx, with their free edge forwards and downwards, thus forming on each side of the larynx a *cul-de-sac* behind the deep face of the vocal cord and posterior border of the arytenoid cartilage, and which will freely admit one finger in an average horse. The respiratory surface of all the laryngeal structures is lined with mucous membrane.

[1] Read before the Western Counties Veterinary Society prior to demonstrating the operation on several roarers, at Exeter, April 21, 1910.

In normal respiration the arytenoid cartilage moves freely, being drawn outwards by the crico-arytenoideus posticus (the dilator of the larynx) during inspiration, and potentially obliterating the ventricle, while during expiration it dips, as it were, carrying the vocal cord with it, so that the two vocal cords have a tendency towards approximation. This action is due to the constrictors of the larynx. In unilateral paralysis of the opened larynx this movement can be readily seen on the normal side, whereas on the other side the arytenoid cartilage and vocal cord are motionless beyond slight vibration, *i.e.*, the normal rhythm is wanting on that side. The effect of this on the horse is that the larynx is not properly dilated during inspiration, and if exercise is forced some degree of distress occurs, and the flaccidity of the vocal cord allows it and the arytenoid to vibrate and produce the sounds known as roaring or whistling.

I do not intend to discuss the etiology of the condition now, but the fact that the paralysis and atrophy are so commonly limited to the muscles supplied by the left recurrent nerve renders it reasonable to conclude that the peculiarities of the course of the nerve in the thorax are responsible.

Obviously the simplest way of overcoming the distress is to insert a tracheotomy tube, but that is always unsightly, wants constant daily attention, and there is always a considerable amount of noise remaining. To do away with these objections several operations on the larynx have been suggested and attempted. The pioneer appears to have been Professor Günther, of Hanover, who began experimenting in 1834, and practised at various times the following operations, according to Liautard: (1) Resection of both vocal cords; (2) removal of the vocal cord of the paralysed side of the larynx; (3) the partial excision of the arytenoid cartilage; (4) the total extirpation of the arytenoid (arytenoidectomy); (5) the removal of the vocal cord and of the corresponding laryngeal ventricle; and (6) the fixation of the arytenoid cartilage by an ankylosis at its articulation with the thyroid cartilage.

According to Fleming, Professor Günther "finally endeavoured to bring about a firm adhesion between the inner surface of the thyroid and the outer surface of the arytenoid cartilage by excising the laryngeal sac, but leaving the vocal cord intact." This is the operation we propose to perform to-day. It has lately been reintroduced by Professor W. L. Williams, of New York, who worked it out quite independently of Günther's work. He claims very encouraging results, and kindly described it to me and showed me excellent photographs

of larynges which had been operated upon with success, in which the arytenoid cartilage and the vocal cord were adherent to the side of the larynx. He subsequently operated in Hobday's presence, and since then I have also seen Hobday operating. The present popularity of the operation is undoubtedly due to Hobday's enthusiasm.

Still another operation has been attempted, and fair success claimed—viz., arytenoidorraphy, which consists of suturing the vocal process of the arytenoid back to the wing of the thyroid, and so preventing the dipping and vibration.

It seems to me that the operation we are about to perform is likely to be fraught with the fewest complications, and, as many horses are now being operated upon, we shall soon know what results to expect. It must only be performed on cases with undoubted paralysis, and care must be taken that no cartilages are wounded beyond the original incision through the cricoid.

The Operation.—The horse must be cast on his side and chloroformed. While being anæsthetized the laryngeal region may be washed, and then the patient must be fixed on his back with his head resting straight on his poll, and the nose fully extended. I usually inject adrenalin or renastyptin under the skin and into the muscles of the operation area in order to diminish the oozing of blood which otherwise may obscure the deeper operation field. An area is then shaved on the middle line, 2 in. wide, extending from the intermaxillary space to at least 6 in. behind the level of the angles of the jaws. After disinfection the incision is made about 4 or 5 in. long, the anterior limit being level with the angles of the jaw, and cutting through the skin at one stroke. A number of cutaneous vessels must now be picked up with artery forceps. Next cut the paniculus and expose the sterno-thyrohyoideus muscles. The junction of these along the middle line can be seen, and the incision is continued through this septum down, to expose the body of the thyroid cartilage, the cricoid cartilage, and one tracheal ring. The danger from carelessness lies on either side of the seat of operation where the thyro-laryngeal artery comes from the carotid. Another danger zone is the anterior limit of the cutaneous wound where the submaxillary glands are situated, and with the submaxillary artery, and vein and Stenson's duct on either side.

The skin and muscles are slightly retracted, and the larynx palpated to definitely locate the thyroid cartilage, cricoid cartilage, crico-thyroid ligament, and the crico-tracheal ligament. With the head perfectly straight, the crico-thyroid ligament is pierced and the incision

extended forward to, but not including, the body of the thyroid cartilage, and then backwards, cutting outwards through the cricoid cartilage and the crico-laryngeal ligament. I have not found it necessary to cut the first tracheal ring, but that may be done. I have not found any necessity to use a tampon cannula. The larynx is now held open by means of a special spreader and the interior examined. If one or both arytenoid cartilages lies motionless, the operation may be proceeded with, but if both are moving freely during respiration it is useless to proceed, since paralysis is obviously not the cause of the trouble.

Having decided to proceed, the vocal cord of the paralysed side, which is noticed towards the anterior extremity of the wound, must be drawn back by a small repeller, and the entrance to the ventricle revealed. A circular incision is then made through the mucous membrane with a razor knife, and both edges of the portion to be removed are grasped with long forceps. The membrane must then be separated carefully with a blunt spatula or a finger all round and to the bottom of the sac and then lifted out. It is somewhat thin at the depth and easily torn there, but it is rather thick for the rest of its extent. If great care is not taken, a piece of the *processus vocalis* of the arytenoid will be removed also. All that now remains is to cleanse the larynx and trachea of blood and to mop out the ventricle. The horse is rolled on to his side and allowed up as soon as possible. No sutures are required or advisable. Subsequent treatment consists of sponging the lips of the external wound several times daily with damp wool wrung out in carbolic solution.

For between two and three weeks the horse breathes through the operation wound and his nose, and during that time the connective tissue surfaces of the ventricle are becoming united, the arytenoid cartilage and vocal cord being bound down in course of time to the side of the larynx. The external wound should be completely cicatrized in four weeks, but the ventricular cicatrized tissue is not strong enough to warrant galloping the horse as a test for at least eight weeks. In other words, the horse must have absolute rest from exercise for four weeks, and must then undergo a course of conditioning, and not thoughtlessly galloped for another month. Hence the best time is the end of the hunting season for hunters.

Now as to the usefulness of the operation. In the first place, it is an excellent substitute and improvement on tracheotomy. It is not likely to make an unsound horse sound. Unworkable horses will be made workable, and a hunter roarer will not be heard "three fields

away," as the saying goes. It will not affect the heredity of the condition either on the dam's side or on the part of the sire. In fact, I go so far as to say it ought not to be performed on a sire, otherwise it is countenancing a fraud.

In a nutshell, distress should be relieved, and sound either much reduced or completely obliterated. It remains to be seen yet in what percentage of cases these desirable results will be obtained. The operation, however, would appear very promising, and there is still the consolation of knowing that if the required relief is not obtained tracheotomy may still be resorted to.

Possible ill-effects are: Pneumonia, asphyxia, excessive granulation, and ordinary risks of casting and of wounds, as tetanus and malignant œdema, &c.

A DISEASE OF SHEEP[1] IN TASMANIA.[2]

BY J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.

Professor of Veterinary Pathology in the University of Melbourne.

I HAVE the honour to report on the result of my investigations regarding an extremely fatal disease of sheep which appears annually in certain districts of Tasmania, and some cases of which I was able to examine, in company with Dr. Willmot, Government Veterinarian, during my recent visit.

History.—The disease has apparently been known for a number of years, and Dr. Willmot is of opinion that its occurrence is more general than is at present recognized.

It occurs as a rule at a definite period of the year, viz., during the months of August and September. It is associated, not so much, however, with the actual time of the year, as with the condition of the herbage about that season.[3] According to the observations of those who have had considerable experience of its ravages, it prevails just immediately after the early spring rains, when the young grass is

[1] As it is evident this disease requires a special name—one which, while being indicative of its chief characteristics, would at the same time convey a suggestion of its similarity to other diseases of somewhat allied character—I consulted my colleague (Professor Allen), to whom I am indebted for the valuable suggestion of "Malignant Transudation." I therefore propose it should be known by this term, and that the pathogenic bacterium be designated the *Bacillus transudationis malignæ.*

[2] A Report to the Minister for Agriculture, Tasmania.

[3] It is interesting to note that sheep display no definite immunity to experimental inoculation with the specific microbe during the summer months as has been demonstrated by a number of experiments I have conducted since writing this report.

beginning to shoot through the ground. Hence, owing to the mild weather and copious rains experienced this year during the month of June, it was fully anticipated by those who have experience of the disease that outbreaks would occur much earlier than usual, and these fears were justified.

Soil.—Beyond the fact that animals do not appear to become affected on the poorer classes of soil, no definite information could be elicited.

Animals Affected.—The disease is confined to sheep, and particularly to young sheep (hoggets) in good condition. It seldom or never attacks adult sheep, and has never been known to affect even hoggets in comparatively poor condition or suffering from diarrhœa, &c.

That the disease is a serious one, both for the flock-owner and for the State, is proved by the fact that on the property which I visited in connection with the investigation the mortality amongst hoggets from it alone is from 10 to 15 per cent. annually. If its occurrence is at all widespread, the necessity for preventive measures being taken is therefore manifest.

Symptoms.—These may be summed up in the one word "None." The owner of the property visited informed us that during his ten years' experience of its ravages he had only observed two live animals affected with the disease, and, curiously enough, one of these cases occurred on the date of our visit. The almost universal experience is for the shepherd to find one or more animals lying dead. There is no evidence of struggling prior to death, the position assumed being generally that of sleep. Usually, however, there is considerable distension of the belly through generation of gases within the stomachs and bowels, and, in addition, the whole of the carcase is in a more or less advanced stage of putrefaction, while there is commonly a blood-stained frothy material oozing from the nostrils. The skin of the thighs and armpits is generally dark and livid in colour and puffy to the touch, while the wool can often be readily removed. On opening the carcase there is generally a decided odour of putrefaction, and more or less blood-tinged fluid around the bowels and in the chest cavity. Such, shortly, are the features of the disease, as they have been noted by careful observers.

As sick animals are so seldom seen, no data can be acquired as to the symptoms ordinarily exhibited. Judging from the living case I observed, however, and the experiments conducted, there would be lassitude, loss of appetite, moping, &c., for some hours before death

actually occurred. Death seems more prone, even in experimental animals, to occur during the night or early morning, which, together with its rapid progress and with the difficulty of carefully examining individual sheep in a flock, explains the absence of any definite information.

Cases Examined.—On the morning of the day previous to our arrival two hoggets were found dead; while on the day of our visit another death had occurred, and one hogget was evidently suffering from some serious disease, and on the point of death.

The three carcases, which had been kept for examination, were extremely distended with gas, showed bloody froth at the nostrils, and were in advanced stages of decomposition; the two, which had been dead for nearly thirty-six hours, too much so for examination to be attended with any degree of satisfaction.

The animal which died during the previous night or early morning was, however, carefully examined *post mortem*, specimens of fluids and tissues being secured for more detailed microscopic and bacteriological examination later on. Following are the notes on the pathological changes:—

Carcase well nourished and in fat condition. Body still retaining some warmth in the armpits, &c. *Rigor mortis* fairly well established. Extreme tympany of the stomachs and intestines, the abdomen being greatly distended. Bloody, frothy material issuing from the nostrils, and evidently arising greatly, if not solely, from the decomposition and the tympanitic condition. No evidence of diarrhœa. No discoloration of the skin. Wool not markedly loose. (In the other carcases discoloration of the skin of thighs, &c., was marked, and probably of *post-mortem* origin.) Underneath the skin of the abdomen and thorax was a quantity of dirty-looking fluid exudate. Abdominal cavity: About a pint of dirty serous effusion, with a distinctly putrid, but peculiar, odour. The stomachs were apparently normal, but for *post-mortem changes* and *post-mortem* digestion of the mucous lining of the abomasum. The intestine, besides some *post-mortem* changes, showed injection of the peritoneal small blood-vessels and patches of hæmorrhage; the rectum contained normal fæces. Liver: Discoloration, due to putrefaction on posterior border; the substance was congested, and a few, small, irregular, greyish necrotic patches were present under the capsule. The kidneys: Pulpy, intensely congested, and broken down with gas. Spleen slightly enlarged, pulpy, and containing gas. Thorax: The cavity contained about 10 oz. of blood-tinged serous fluid, with comparatively little putrefactive odour. The lungs were normal. The pericardium

contained several ounces of effusion similar to that within the pleural cavity. The heart was normal, and the blood feebly coagulated, but did not emit any offensive odour.

The live sheep, which was very weak, dull, disinclined to move even when forced, and barely able to stand, was then killed for examination.

Post-mortem Examination.—Animal fat. Underneath skin of abdomen a small quantity of clear effusion. Abdomen: The cavity contained about a pint of slightly turbid liquid. The intestines from the stomach to the floating colon were practically empty, but normal. The rectum contained normal fæces. Abomasum (fourth stomach) practically empty. At the greater curvature near the cardiac extremity an irregular area of about 2 sq. in. of the wall was thickened and inflamed. On the mucous surface the greater part of this area was in a state of necrosis, the lesion presenting the appearance of a dirty, greyish irregular patch surrounded by a zone of dark-red, swollen mucous membrane.[1] On section the wall was found to be markedly thickened, and the tissues underlying the mucous surface very œdematous. The inflammation extended through to the peritoneal (external) covering of the stomach. The other abdominal organs were normal, the kidneys only being congested. Thorax: The cavity contained about 8 oz. or 10 oz. of clear serous fluid, which rapidly became of a jelly-like consistence after exposure. The pericardium contained a small quantity of similar fluid. The surface (epicardium) of the heart was injected and showed one or two small hæmorrhagic areas, but the organ was otherwise normal. The lungs were normal.

These *post-mortem* examinations, together with the general history of the disease, and its incidence as regards the condition and age of the affected animals, as well as the seasonal occurrence of the outbreak, led me to form the tentative opinion that the malady was similar to, if not identical with, a disease affecting hoggets in New Zealand, which I had already investigated; and also of a similar nature to that disease of sheep known as Braxy, in Scotland. Subsequent examination and experiments have confirmed this opinion.

During the conduct of these *post-mortem* examinations, specimens of blood effusions, &c., were secured in sterilized pipettes for bacteriological examination; smears were made directly for microscopic determination of the bacterial contents at the time of *post-mortem* examination; and portions of tissues were also preserved.

[1] Subsequent microscopic examinaton (*see* addendum) proved this to be the original esion and the location of multitudes of the apparently specific bacterium.

On my return to Melbourne these materials were carefully examined, and attempts made by experiment, &c., to ascertain the exact nature of the disease and isolate its determining factor. Success has attended these efforts. Unfortunately, owing to the lapse of time between death and the *post-mortem* examination of the first case, a large number of bacteria, obviously of foreign or accidental origin, had invaded the fluids and tissues, and multiplied greatly: Even in the animal which was slaughtered these accidental microbes had been able to traverse the intestinal wall during the comparatively prolonged illness, and complicate the position so far as bacteriological examination was concerned. The contents of the intestine, particularly of the large bowel, are in all animals found to contain enormous numbers of bacteria, including those of a putrefactive nature, and immediately after death (sometimes before that occurs), numbers of these organisms penetrate the wall, enter the blood-stream, the abdominal cavity, &c., and multiply with very great rapidity. The consequence in this instance was that an enormous amount of work had to be done before the specific bacillus causing the disease under investigation could be finally isolated and cultivated in a state of purity, as can be seen by reference to the addendum. However, already, although there remains much work of scientific and even practical interest to be accomplished, we have sufficient data to enable a fairly complete account of the nature, cause, and pathology of the disease to be rendered.

Nature of Disease.

The disease is characterized by an intense toxæmia or general poisoning of the animal's system by means of the toxic products elaborated by the specific bacterium during its multiplication within the animal body, accompanied by the formation of serous exudates or effusions (more or less blood-tinged) within the serous cavities and subcutaneous tissues, congestion of the kidneys and liver (probably as a result of the attempt by these organs to neutralize and eliminate the toxic products), often necrosis of small areas of liver substance, and occasionally congestion of the spleen, hæmorrhages about the heart, &c. Either before or soon after death there is hæmolysis or disintegration of the red blood-corpuscles throughout the body, and putrefactive changes may either accompany the terminal phases of the disease, or rapidly follow death, owing to the invasion by putrefactive organisms from the intestine.

The disease is due to a bacillus which, on being introduced into the connective tissues, such as that underneath the skin, and probably that

underneath the mucosa of the alimentary canal, multiplies with great rapidity, and generally under natural conditions produces death so rapidly that premonitory symptoms are rarely observed.

It is possible that the bacillus may be introduced into the tissues under natural conditions in two ways: (1) by pricks, &c., of the skin, with contaminated vegetable spines or prickles; and (2) through abrasions in the wall of the alimentary canal made by parasites, &c.

While it is impossible to deny that natural inoculation could occur by the first means in view of the experiments detailed, it must be admitted that the season of the year, the bareness of the pastures, and the state of the herbage, are against the probabilities of its being a common occurrence. On the other hand, the second means is likely to be common: The micro-organism undoubtedly has its natural habitat in the ground; the young blades of grass shooting through after rain often carry considerable portions of earth; the sheep, being a close-grazing animal, is very liable, therefore, to ingest particles of bacteria-infected soil before natural germicidal agencies, such as sunlight, have had time to operate; the common presence of parasites of various kinds in the stomach and intestines of sheep, especially at the period of the year when the disease prevails, provide a ready means of abrading the mucous membrane, and so facilitating the entrance of the bacillus to the adjacent tissues; the early onset of putrefactive changes following death in natural cases, compared with cases where the bacillus has been experimentally introduced under the skin (*i.e.*, much further away from sources of contamination); and, above all, the definite lesion of the stomach, together with the very small nematode found in the sheep which was killed (*see* results of microscopical examination), all support this view.

Adult sheep appear to be immune, or almost immune, to this disease. This has not yet been demonstrated to be the case by experiments, but it will be observed that the two eighteen-month-old sheep survived much longer than the eight-month-old sheep the introduction subcutaneously of exactly the same-sized dose of the same culture.

Furthermore, the disease does not appear to affect naturally sheep in poor condition, or, indeed, sheep which are not in good fat condition. In these respects this disease, as in many others, simulates blackleg in cattle, which rarely attacks naturally any but young stock in very good condition, and can be even experimentally but rarely conveyed to calves in poor condition. The disease is, however, quite distinct from blackleg, although it may be classed under the same group. The blackleg bacillus is innocuous for rabbits and pigeons, whereas the bacillus of this disease is extremely fatal (*see* experiments).

Infection.—The disease is neither infectious nor contagious in the ordinary sense. It is unlikely that it is ever transmitted from an affected living sheep to a healthy animal.[1] The bacillus, like those of blackleg, anthrax, and malignant œdema, probably has its normal life in the ground, and so to say, only becomes parasitic by accident. While this is true there is no doubt that the carcase of an animal dead of the disease must become a potent source of fresh infection, In our studies we have observed that although at the moment of death the blood of an animal may be apparently free of bacilli so far as microscopical evidence can determine, yet if kept for some hours at blood heat the few which must have been present—perhaps only one bacillus to several drops—have multiplied so rapidly that they may, on again examining the blood microscopically, be found in great numbers. A fat sheep retains after death, even in cold weather, its body warmth a sufficient length of time to enable the bacilli to multiply enormously, and render each drop of blood a possible source of contamination. These bacilli form spores which, like all bacterial spores, are extremely resistant to heat, especially dry heat, and other natural germicidal agencies. So long as a carcase remained unskinned there would be probably little danger of spreading the germs ; but I presume the skin is generally removed. Then, if the carcase be not deeply buried (or, better, burned), these myriads of spores are liable to be spread by dogs and other carrion animals over a considerable area and new centres of infection (endemic) established. In connection with this I am pleased to record that the gentleman whose property I visited assured me that he is always careful that all dead animals are buried; but for this precaution his losses might possibly have been heavier.

Characters of the Bacillus.—A short rod often found in pairs, non-motile, sporulating generally at one end but often in the centre, Gram positive, strictly anaerobic, growing readily in blood-serum, and in artificial media, to which serum is added, when distinctly alkaline, and air excluded rigorously, but refusing to grow in neutral or acid artificial media.

In size it is fairly constant, being from 4 to 6 μ in length, and 0·5 μ in breadth.

[1] The absence of contagion in the ordinary sense was shown by the following experiment conducted later: A ewe, with lamb three months old at foot, was placed in a pen. The ewe was inoculated with a culture of the bacillus, and succumbed in sixty hours. The lamb remained in the same pen for a fortnight, without exhibiting any evidence of illness. At the end of that period it was also inoculated with a culture, and succumbed in due course. Thus the infection was not conveyed by contiguity, and immunity was not acquired by the lamb.

Red blood-corpuscles of all animals become rapidly dissolved as a result of the growth of the bacillus. Serum of sheep tinged with blood becomes rapidly turbid, the blood-corpuscles dissolved, and the liquid early acquires the same dirty-looking tint that characterizes generally the peritoneal effusions in sheep.

The bacillus in growing produces a small quantity of gas in serum, and in ordinary alkaline serum-broth, with a slight colour that cannot be termed strictly putrefactive, though it in some measure suggests such a description.

In small doses the bacillus is rapidly fatal to the guinea-pig, the rabbit, the pigeon, the rat, and to the sheep. In young sheep under a year old death occurs in from eighteen hours (with a dose of ½ c.c.) to thirty-six hours (with ¼ c.c.) of a culture a few hours old. In older sheep eighteen months old, even with the smaller doses, death occurs within forty-eight to sixty hours.

Post-mortem Appearances.—All animals present practically the same *post-mortem* picture. There is the œdematous subcutaneous swelling of the inoculated region, more or less peritoneal, pleural, and pericardial effusion often somewhat blood-tinged or turbid, injection of the peritoneal and intestinal vessels, congestion of the kidney and liver with often areas of necrosis on the latter, and often small hæmorrhages about the heart, the severity of the lesions depending greatly on the period elapsing between inoculation and death.

When a naturally affected animal is found dead, there is always bloody froth issuing from the nostrils, extreme distension of the belly with gas, and often more or less discoloration of the skin of the inner part of the thighs. On skinning the carcase the tissues underneath the skin of the belly are infiltrated with a blood-tinged watery material; there is more or less gas in the muscles, &c.; and a putrid odour is usually noticeable, sometimes very marked. The cavities of the belly and chest and that enclosing the heart contain a quantity, varying in amount, of turbid, dirty-looking fluid; the spleen, liver, and kidneys are more or less easily broken down, and contain gas bubbles; while the heart shows hæmorrhages, small in extent, either beneath the covering or lining membrane.

As already stated, the putrefactive odour and the gas bubbles are chiefly the result of the entrance of putrefactive germs through the intestinal wall into the cavity of the abdomen and the blood-channels. This was definitely shown to be the case in the *post-mortem* examination of sheep 2 in the experiments.

Prevention.—While it is more than probable further research (which

would require much time and expenditure of money) would discover a system of preventive inoculation similar to that adopted with so much success in blackleg and in anthrax, yet, meanwhile, some practicable measures can be suggested that have the commendation, at all events, of being inexpensive. As a matter of fact, from my experience of a similar, if not identical, disease in New Zealand, I tentatively suggested certain measures to the owner of the property visited.

The first of these obviously consists of the burning, if possible, and, if not, of the burial, of any carcase where it is found, in order to prevent the contamination of fresh centres by natural agencies, such as dogs, running surface-water, &c.

The second is based upon the seasonal nature of the disease and the age incidence, and is as follows: —When late winter or early spring rains occur, especially if the weather is mild and the result is likely to be a flush of young grass, the young sheep should be removed to the rougher pastures (even at the expense of some loss in condition). The older sheep—for example, the ewes—could be placed on the affected or suspected pastures if found necessary in the management of the farm. When the young grass had attained a considerable growth, the younger sheep could be again placed in the paddocks in question, care being exercised to see that at no subsequent time during the danger months was the feed eaten close down. The disease of a similar nature in New Zealand affecting only hoggets in winter fed on turnips does not appear till the roots are well eaten down, or until the sheep are liable to ingest more or less soil along with the food, in which respect it also resembles the disease under review.

Similar Diseases and Comparisons.

Anthrax.—Is similar in the suddenness of death without previously observed symptoms; but the almost constant enlargement of the spleen, its pulpy tarry nature, and the tarry condition of the blood are marked naked-eye differences; while under the microscope the characteristic bacillus could not be mistaken for the bacillus of this disease.

Blackleg.—While blackleg is said to occasionally attack sheep—and experimentally they are very susceptible—in my experience it has never occurred naturally, even on farms where numbers of cattle die annually. The characteristic swelling of an affected group of muscles (those of the hind-quarter, fore-quarter, loin, &c.), the crackling feel of the skin even during life (so marked in blackleg), and the characteristic smell of blackleg-affected muscles, are absent. The blackleg

bacillus is larger, although otherwise very similar ; but it is innocuous for rats, rabbits, pigeons, &c.

Malignant Œdema.—This disease in certain countries is common in sheep as a form of "blood-poisoning," through infection of wounds after shearing and "marking."

There is great swelling and blackness of the tissues in the vicinity of the wounds, with much gas-formation even during life, which, along with the time of occurrence, renders a distinction easy. The specific micro-organism is quite different in certain characteristics, and could not be mistaken for that of the present disease.

Braxy.—A disease common in Scotland and North-western Europe, Iceland, &c., closely resembles that under review, in its seasonal and age incidence, the susceptibility of fat animals, the absence of *ante-mortem* symptoms as a rule, the rapid putrefaction following immediately on death, the presence of stomach lesions, peritoneal and other effusions, and, generally speaking, the *post-mortem* appearances. The bacillus isolated by Hamilton in Scotland (see Report of Departmental Committee on Louping Ill, and Braxy, 1906), however, though presenting a number of points of similarity, yet differs in many respects, chiefly in regard to odour of cultures, virulence of cultures for guinea, pigs, and even for sheep.

"Braxy-like" Disease of Sheep in New Zealand.—So provisionally termed by me because of its great similarity in age and condition of affected animals, the seasonal incidence, absense of symptoms, and *post-mortem* appearances, to true braxy, is the disease which most closely resembles, if it is not identical with, the affection in Tasmania. Owing to the success of the preventive measures recommended rendering it impossible to secure material for completing certain details of the investigation, which had been postponed pending the erection of new experimental buildings (a circumstance fortunate for the farmer, but rather disappointing to the investigator), I am unable to compare the two diseases as fully as I should desire.

Summary.

The disease belongs to what has been designated the Braxy group.

It is due to a specific microbe, a bacillus, which forms resistant spores, and hence is able to retain its virulence in the soil for a long period.

The bacillus may gain entrance to the system of the sheep either by means of skin punctures or through abrasions in the lining membrane of the alimentary track.

Rarely are any symptoms of illness observed, affected animals being usually found dead in the morning.

As putrefaction follows rapidly on death, the carcase is almost invariably discoloured, greatly distended with gas, and a greater or less quantity of blood-tinged froth is seen issuing from the nostrils.

On opening the carcase there is nearly always present a quantity of fluid, dirty-looking, or more or less blood-tinged, in the belly and chest cavities, and also in the sac enclosing the heart. The disease affects principally hoggets, and is almost confined to those in good condition.

It is most commonly seen during August and September, but may appear earlier in the year, and seems to be definitely associated with the spring growth of young grass.

The disease is not contagious in the ordinary acceptation of the term, the common source of infection being the ground.

Dead carcases should, however, be buried deep, or preferably burned, as such are otherwise liable to reinforce the infection and establish new areas.

Preventive measures at present available are (1) destruction of carcases, and (2) removal of hoggets from infected pastures during the danger season of the year.

Recommendations.—I suggest that full particulars regarding the disease should be circulated by you amongst the sheep farmers in the State, and that they be requested to co-operate with the Department of Agriculture, both in ascertaining its extent and in diminishing the losses sustained.

All measures of quarantine and restriction of movement should be eschewed, as they are unnecessary, and would in any case prove futile. I feel certain that, as elsewhere in my experience, were the farmer to feel confident that his name would not be divulged, directly or indirectly, and so the reputation of his property be unaffected, he would welcome any assistance by the State, and furthermore would freely co-operate in the rendering of all information regarding this and similar diseases that may from time to time afflict his stock.

To enable the farmer to afford the necessary assistance in a concise form it would be well to attach to the leaflet a perforated page containing the following queries, leaving spaces for answers:—

(1) How long have you been in possession of your property?
(2) When did this disease first make its appearance?
(3) What is your annual percentage of mortality?
(4) What breed and age of sheep do you find most affected?

(5) Is any special class of soil affected?
(6) At what period of the year do the losses usually occur?
(7) Has your annual loss increased or diminished since the disease first appeared?
(8) Kindly state any other information which you think would be of value.

(The addendum, which contains the details of the Bacteriological Investigations, is unavoidably held over until next month.—EDS., *V. J.*).

THE INFLUENCE OF OÖPHORECTOMY UPON THE GROWTH OF THE PELVIS.[1]

BY S. G. SHATTOCK AND C. G SELIGMANN.[2]

WHEN we recall the widespread and diverse effects induced by early castration upon the growth of the accessory organs of generation—the prostate, the vesiculæ seminales, the Cowper's glands, not to mention the arrest or modification resulting in the secondary or external sexual characters—we are naturally led to ask how far removal of the ovaries in the young is followed by a corresponding hypoplasia or undergrowth in the accessory parts of the generative apparatus in the female. These parts comprise not only the uterus, vagina, and mammary glands, with the glands of Bartholin, but also the pelvis, and it is with the last-named that the present communication deals.

THE INFLUENCE OF DOUBLE OÖPHORECTOMY UPON THE GROWTH OF THE PELVIS.[3]

That the growth of bone may be modified by the absence of certain internal secretions appears from some of the results of castration and of disease. After castration, carried out in the young of the Herdwick sheep, a variety in which the male alone is furnished with horns, not only is the growth of the horns (as we have found) completely prevented, but, in addition to this, the normal change of form which the male skull undergoes no longer takes place. The hornless skull of

[1] Abstracted from the *Proceedings of the Royal Society of Medicine.*

[2] The expenses incurred by these observations were defrayed partly by a grant from the Scientific Grants Committee of the British Medical Association, and partly by the Lister Institute, at the Elstree farm of which the calf to be referred to was kept for the chief part of the time.

[3] Certain of the functions of the ovary as an organ of internal secretion have been discussed by F. H. A. Marshall and W. A. Jolly (*Phil. Trans.*, Royal Society, 1905-6, p. 123). These deal with phenomena connected with pregnancy, and œstrum or "heat."

the castrated Herdwick resembles that of the ewe; the plane of the os frontis is continued backwards behind the orbits at a very obtuse angle, whilst in the intact ram the plane of the frontal behind the orbit lies almost at a right angle with the inter-orbital portion of the bone, the horn-cores arising from the upper or horizontal area. One might be tempted at first to ascribe this failure of cranial change to the absence of horns, but more probably both results are due to the same cause, seeing that the horns of the sheep do not come, like those of the rhinoceros, into the category of mere cutaneous appendages, but are provided with osseous cores. In regard to the long bones, one of the well-recognized results of castration carried out in the young animal is an increase of their length.

A more striking example of such indirect glandular influence upon the growth of bone than that furnished by the increase in length of the lower limbs after castration, is the well-known one of cretinism, where the deficiency of thyroid secretion is followed by diminished intra-cartilaginous growth of the several bones of the skeleton.

A question of theoretical interest here arises on which we may briefly digress. Is the striking shortness of the limbs in certain varieties, occurring amongst species of animals in general well proportioned, due to a thyroid deficiency which has become inherited? The most widely known example of short-limbness is the dachshund. Amongst sheep the same thing is illustrated in the ancon short-legged variety, to which Darwin refers.[1] In this case the variety arose *per saltum* as a sport, in a ram lamb. The animal was born in Massachusetts in 1791, and from this one lamb the breed was raised. As these sheep could not leap over fences it was thought that they would prove valuable, but they have been supplanted by Merinos. These sheep were remarkable for transmitting their peculiarity so truly that their original describer, Colonel Humphrys,[2] never heard of but one —questionable—case of an ancon ram and ewe not producing ancon offspring; when they are crossed with other animals their offspring, with rare exceptions, perfectly resembled either parent, no intermediate forms appearing. Amongst bovines, *the* example is the Dexter, a variety which appears to be indigenous in the South and South-west of Ireland, and of which a certain number of herds are kept in England.[3] The feature of the breed is the shortness of the

[1] "Variations of Animals and Plants under Domestication," first edition, i., p. 100.

[2] *Phil. Trans.*, London, 1813, p. 88.

[3] A full account of these cattle, and of the cretinism so frequently occurring in the calves, has been given by one of us (C. G. Seligmann) in the *Transactions of the Pathological Society*, lv., p. 1.

limbs. The head presents, like that of the dachshund, no cretinoid deviation of form. Now the noteworthy circumstance in connection with the short-limbed Dexter is the frequency with which it bears cretinous or "bull-dog" calves—a frequency far exceeding anything that obtains in ordinary breeds of oxen. In one herd, for instance, in this country in the year 1901, out of twenty-one births there were no fewer than seven cretins. This association of an apparently simple short-limbness in the adults with cretinism in the calves so strongly suggests that the former may be due to a thyroid defect (insufficient to produce the full condition of cretinism, but of a kind capable of producing one of its features) that we were led to test the effect of prolonged thyroid feeding upon the young dachshund.

As this observation has not hitherto been published we may here record it, although the result was negative. The dachshund, a female, was born on January 1, 1906. It had distemper in April, and was convalescent in May. The thyroid administration was commenced on May 10—*i.e.*, when the pup was under five months of age. The batches of tabloids used were freshly prepared (from the dispensary at St. Thomas's Hospital); each contained 3 gr. of dried sheep gland (Thyroideum siccum, British Pharmacopœia). For the first week a single tabloid was given each day, during the next week two, then three, and after the fourth week the daily dose was four. No ill-effects were at any time observed. The last four tabloids were given on May 12, 1908. The dog was thus kept under thyroid administration, with only an occasional week's intermission, for two years. No elongation of the limbs beyond what is normal to the variety has taken place during the period of growth, and the animal, which is at the present time perfectly well, presents all the marks peculiar to this variety of dog.

The Results of Oöphorectomy in the Pig.

In the Natural History Collection at South Kensington there are the skeletons of two examples of Potamochœrus, the pelves of which we have measured, with the following results:—

1364 B: Male, fully grown. Symphysis pubis synostosed; no epiphysial lines on the long bones. Pelvis: Maximum transverse diameter of inlet, 80·5 mm.; antero-posterior diameter, taken from the summit of the symphysis to the sacral promontory, 103 mm. Femur: Length taken by means of callipers from the summit of the head to the lowest point of the inferior articular extremity, 206·5 mm.; this bone was measured as an index to the size of the animal.

1363 B: Female, fully grown. Symphysis pubis synostosed; no epiphysial lines on the long bones. Pelvis: Maximum transverse diameter of inlet, 80·5 mm.; antero-posterior diameter, taken from the summit of the symphysis to the sacral promontory, 104·5 mm. Femur: Length, taken as in the preceding specimen, 182·5 mm.

The length of the femur in the female of these two specimens is 24 mm. less than in the male—*i.e.*, the animal is somewhat smaller—nevertheless, the diameters of its pelvis are equal to those of the larger male.

These measurements were sufficiently promising, as indicative of a sexual differentiation in the pelvis, to lead us to take the common domesticated pig for studying the results of oöphorectomy.

In October, 1903, three piglets were selected from the same litter; one female was kept intact, one was spayed, one male was castrated. Nothing untoward occurred after the operations, which were done by an expert "cutter," the whole of the uterus, with the ovaries, being removed through a small abdominal incision, and the testicles by an incision through each half of the scrotum. The animals were killed when full grown, November 2, 1904, December 6, 1904, January 20, 1905, and of each the pelvis and right femur were prepared by maceration. The measurements in the case of the two sows are as follow:—

SPAYED SOW.

Antero-posterior diameter of inlet of pelvis	93 mm.
Transverse diameter of pelvic inlet	65 mm.
Extreme distance between the outer borders of iliac crests ...	166 mm.
Height of pelvis from ischial tuberosity to the summit of the iliac crest	236 mm.
Length of right femur from summit of the great trochanter to lowest point of condyles	206 mm.

UNSPAYED SOW.

Antero-posterior diameter of inlet of pelvis	91 mm.
Transverse diameter of pelvic inlet	64 mm.
Extreme distance between the outer borders of iliac crests ..	163 mm.
Height of pelvis from ischial tuberosity to the summit of the iliac crest	231 mm.
Length of right femur from summit of the great trochanter to lowest point of condyles	194 mm.

It will appear that all the measurements of the pelvis of the spayed slightly exceed those of the unspayed animal. The differences in diameters of the inlet of the two pelves do not amount to more than an excess of 2 mm. on the antero-posterior and of 1 mm. on the transverse. The femur of the spayed is 12 mm. longer than that of the unspayed, showing that the animal was the larger. This reduces the

very small differences in the pelvic diameters to *nil*. In the castrated boar the antero-posterior diameter of the pelvic inlet is 85 mm.; the transverse is 65 mm. ; the extreme length of the right femur is 202 mm. As one effect of castration is to increase the length of the long bones, very little can be deduced from the above measurements, as the standard of size is thus vitiated. The transverse diameter of the pelvic inlet is equal to that of either of the sows; the antero-posterior is less.

The differences brought out in the pig being so small as to be indecisive, it became imperative to make use of an animal of much larger dimensions, and one in which there is normally a pronounced difference between the pelves of the two sexes. It is probably true generally that in animals (such as the rabbit and pig) which bring forth a large number at a birth there is but little pelvic differentiation, whereas in those which bear but one or two young the size of the fœtus would, as compared with the parent, be relatively larger ; and this would entail an increased capacity of the true pelvis on the part of the female.

The Results of Oöphorectomy in the Ox.

These considerations led us to test the question upon the bovine. In the British Museum (Natural History) there are the skeletons of a full-grown male and female European bison and those of a fully-grown Chillingham bull and Chillingham cow. The following measurements, which we were enabled to make, bring out a difference in the size of the pelvis in the two sexes of these cattle:—

European Bison (*Bos bonassus*).

Male (fully grown).

Pelvis	Transverse diameter of inlet	163 mm.
	Antero-posterior diameter in inlet	224 mm.
Femur (length taken by means of callipers)		435 mm.

Female (fully grown).

Pelvis	Transverse diameter of inlet	171 mm.
	Antero-posterior diameter of inlet	247 mm.
Femur (length taken by means of callipers)		396 mm.

Chillingham Oxen (*Bos taurus*).

Male (fully grown).

Pelvis	Transverse diameter of inlet	146 mm.
	Antero-posterior diameter of inlet	204 mm.
Femur (length taken with callipers)		351 mm.

Female (fully grown).

Pelvis	Transverse diameter of inlet	163 mm.
	Antero-posterior diameter of inlet	219 mm.
Femur (length taken with callipers)		330 mm.

In these four skeletons it will be found from the measurements given that in each of the females the diameters of the pelvis exceed those of the males, although the length of the femur is less :—

		Male (Bison)	Female
Pelvis	Transverse diameter	163 mm.	171 mm.
	Antero-posterior diameter	224 mm.	247 mm.
Femur (length)		435 mm.	396 mm.

		Male (Chillingham)	Female
Pelvis	Transverse diameter	146 mm.	163 mm.
	Antero-posterior	204 mm.	219 mm.
Femur (length)		351 mm.	330 mm.

On April 27, 1906, a calf was spayed (from the flank) by Mr. F. L. Gooch, F.R.C.V.S., of Stamford, Lincolnshire. The animal was all red in colour, of the Shorthorn breed, and was exactly 7 weeks old when the operation was carried out. Recovery was uninterrupted, the external wound healing by first intention. The parts removed comprise the ovaries, together with the Fallopian tubes, and a portion of each uterine cornu 5 cm. in length ; where cut across the cornu has a diameter of 0·6 cm. Each ovary is 2 cm. in the longer diameter ; in the periphery of the divided surface there are a series of follicles (the largest 2 mm. in diameter), the presence of which gives a moruloid character to the free, uncut exterior.

The animal was shortly afterwards transferred to the Elstree farm of the Lister Institute, where it was kept until August 4, 1908, when it was killed, being at that date 2 years and 5 months old, and in perfect general condition. The teats were diminutive ; they measured in length not more than 2 cm., and were correspondingly reduced in diameter. Each of the mammary glands was represented by a huge mass of fat. The pelvis was taken out entire, together with the several bones of the right hind limb ; and the skull, with its short, slightly curved horns, was likewise kept. Before being killed the height of the animal was taken with a vertical measuring rod and sliding cross-piece furnished with a spirit-level. The height from the withers (the highest point between the shoulders) to the ground was a fraction over 12 hands ($48\frac{1}{4}$ in.). Measured with a tape from the withers over the trunk and down the fore-limb, the distance was 50 in. From the withers to the root of the tail the distance, with the tape, was 51 in. The distance, with the tape, between the centres of the rounded eminences formed by the crests of the ilia was 17 in. The maceration of the pelvis was first conducted so as to leave the bones connected by their ligaments : the pelvis was allowed to dry, and was measured. The maceration was afterwards carried to completion and the bones disarticulated.

MEASUREMENTS OF THE PELVIS OF THE SPAYED ANIMAL.

Antero-posterior diameter of the inlet	19·8 cm.
Transverse diameter of the inlet.	14·7 cm.
Extreme distance between the iliac crests, taken from the outer borders	41·3 cm.
Extreme distance between the ischial tuberosities, measured from the inner side	14·3 cm.

The bones of the right hind-limb, after maceration, placed in natural apposition and in the extended position, gave a total length of 46 in. (116·8 cm.). In November, 1908, Mr. Gooch was able to supply us with the corresponding parts of a fully-grown, intact cow, aged 6 years, of the same breed—viz., Shorthorn, red. The animal was suffering from double pneumonia and pleurisy. The measurements, taken a day or so before it was killed, were: Height, just over 50 in.; length, from withers to root of tail, 50 in.; width between hips, 18 in.; the animal was just 1 in. higher over the hips than over the withers. After maceration the pelvis of the unspayed animal gave the following measurements:—

Antero-posterior diameter of the inlet	24·0 cm.
Transverse diameter of the inlet	21·5 cm.
Extreme distance between the iliac crests, taken from the outer borders	50·0 cm.
Extreme distance between the ischial tuberosities, measured from the inner side	20·1 cm.

The bones of the right hind-limb, after maceration, placed in natural apposition and in the extended position, gave a total length of 49⅝ in (126·4 cm.). There is thus a difference in the length of the right hind-limbs, that of the spayed animal being 3⅝ in. (9·6 cm.) shorter than that of the unspayed. When the diameters of the pelvic inlet are worked out in proportion to the length of the limb the results are as follow:—

Length of limb of unspayed : Antero-posterior diameter of inlet of unspayed :
Length of limb of spayed : Antero-posterior diameter of inlet of spayed

$$126{\cdot}4 : 24 :: 116{\cdot}8 : x$$

The proportionate antero-posterior diameter in the spayed animal would be 22·2. As a matter of fact, this diameter of the pelvis in the spayed animal is only 19·8 cm.

Length of limb of unspayed : Transverse diameter of inlet of unspayed ::
Length of limb of spayed : Transverse diameter of inlet of spayed

$$126{\cdot}4 : 21{\cdot}5 :: 116{\cdot}8 : x$$

The proportionate transverse diameter in the spayed animal would be 19·8 cm. As a matter of fact, this diameter of the pelvis in the spayed animal is only 14·7 cm. There is a pronounced difference in

the distance between the ischial tuberosities as measured from the inner side. Taking, again, the proportion between the limbs as a standard, the distance between the tuberosities in the spayed would be 18·5 cm., whereas it is really only 14·3 cm. And, lastly, there is a pronounced difference in the width between the iliac crests. Taking the proportion between the limbs as a standard, the distance between the crests in the spayed animal would be 51·7 cm., whilst it really is only 41·3 cm. The proportion between the antero-posterior and transverse diameters of the inlet, moreover, differs. In both, the former exceeds the latter (contrary to the case in man), but the excess in the unspayed is less than in the spayed—*i.e.*, the transverse diameter is relatively greater than the antero-posterior.

Spayed.	
Antero-posterior diameter of inlet	19·8 cm.
Transverse diameter of inlet	14·7 cm.
Unspayed.	
Antero-posterior diameter of inlet	24·0 cm.
Transverse diameter of inlet	21·5 cm.

If the proportions obtaining in the spayed are calculated out for the unspayed, the antero-posterior diameter of the unspayed—20 cm.—would be associated with a transverse diameter of only 17·8 cm., as against the actual 21·5 cm. This observation upon the bovine demonstrates, therefore, that the growth of the pelvis is reduced as a result of double oöphorectomy when carried out at an early age.

ARMY VETERINARY SERVICE.

Colonel L. J. Blenkinsop, A.V.S., D.S.O., Principal Veterinary Officer, Northern Command, has been appointed in a similar capacity to Salisbury from April 18.

By a notification received from the War Office, we are informed that an increase of five officers to the establishment has been sanctioned, as from April 19, 1910.

Clinical Articles.

CHRONIC ABSCESS IN THE MESENTERY, WITH FISTULÆ OPENING INTO THE SMALL INTESTINE; COLIC, ENTERITIS, AND DEATH.

By H. KENDALL, G.M.V.C., MELBOURNE.

THE patient was an aged, grey, draught gelding, admitted to the hospital about 8 a.m. on September 16, 1909. The history of the case was as follows: The horse had been and was paddocked close to the stables. On the 15th he was taken into the stables and given a good feed of bran and chaff at midday, after which he was put to work. Nothing abnormal was observed till after returning to the stable, when he was found to be uneasy, would not eat his food, and soon manifested all the symptoms of ordinary colic. A drench was given by a blacksmith, the contents of which were unspecified, but judging by the appearance of the nostrils and the mouth it contained oil. The symptoms continued through the night till the next morning, when the animal was sent to the hospital.

The symptoms when admitted were temperature, 101·4° F.; pulse, normal; respirations, 16; visible membranes injected; colicy symptoms; rolling; groaning; turning head towards the flank, &c. On oscultation the bronchi were found to contain fluid, due probably to incompetent drenching.

From the history and general symptoms the diagnosis was subacute enteritis following impaction colic; also slight broncho-pneumonia from drench entering the lungs. On admittance the patient was given a drench containing spirits of ether nit.; spt. ammon. ar.; tinct. cannabis indicæ, āā ℥ii. He appeared to have some difficulty in swallowing, but showed no coughing or irritation. Sood afterwards he became greatly distressed, and the breathing became laboured and abdominal, and a quantity of the drench returned through the nostrils. The exciting symptoms disappeared after a short time, but as there was no passage of fæces arecoline hybromide gr. i. was administered subcutaneously. This induced salivation and increased abdominal sound, but did not cause any expulsion of fæces. The symptoms subsided slightly, but later he began backing all round the box, while his expression became very sad-looking. The temperature remained the same all day until about 6 p.m. It then began gradually to rise, as very violent symptoms of abdominal and thoracic pain set in, the breathing became rapid, pulse

weak and greatly increased in frequency. At about 8.30 p.m. he commenced rolling violently and groaning. The temperature rose to 105·4° F., the face had a very haggard expression, the eyes sunken, ears and lower lip hanging loosely, and slight discharge from nostrils. These symptoms increased in severity till shortly before the death of the patient at about 11.30 p.m., which was preceded by a short period of semicoma.

A *post-mortem* examination was held the following morning. On opening the abdominal cavity nothing very abnormal was seen except that there was slight peritonitis in small patches; the small intestines were filled with fluid, and the contents of the great and floating colons were small and comparatively dry. On removing the intestines from the cavity a large ovoid mass, circumscribed and firm in consistency, about 6 in. diameter and about 8 in. in length, was found in the mesentery about the centre of the small intestines, to which it was firmly attached, though not occluding the lumen. On section this mass was seen to be composed of dense fibrous tissue with irregular areas of necrosis throughout. The necrotic areas were composed of dirty semi-purulent material, and communicated with the intestine by means of two irregular tortuous sinuses, the lumina of which were about the average diameter of a pencil. The walls of these sinuses and of the necrotic areas were friable and dirty brownish or black in colour. At the periphery of the fibrous growth was an egg-shaped abscess composed of thick greyish-yellow purulent material. The wall of the intestine in the vicinity of, and for a distance of 18 in. posterior to, the opening of the sinuses was thickened and in a state of acute inflammation, the mucosa showing patches of necrosis. Microscopical examination of the purulent material from the peripheral abscess showed many chains of streptococci lying amongst the pus cells, many of which contained cocci. The necrosed material from the other degenerated areas of the tumour, and from the sinuses showed, besides cocci, numerous bacilli morphologically similar to the necrosis bacillus. The lungs were extensively affected with acute broncho-pneumonia in the anterior lobes, and the inferior borders of the main lobes, while section showed the presence of fluid and ingesta in the bronchi. It was evident that as far as the lung lesions were concerned they were the direct result of maladministration of the fluid drench. The colic and enteritis were, however, due to other causes.

It seems more than probable that originally a streptococcic infection of a mesenteric gland had occurred (possibly a concomitant

of a previous attack of strangles, although the history, so far as could be ascertained, was valueless on this point). The result was the formation of the large tumour mass over the intestine. Ultimately the pus burrowed by at least two fistulæ into the small intestine, and so permitted the entrance of other bacilli such as the *B. necrophorus.* About the same time the irritation extended to the wall of the small intestine, and particularly the mucosa, inducing the colicy symptoms first observed. It is quite possible that, had a more conservative line of treatment been pursued, both as regards the primary drench, and the subsequent treatment with arecoline, the case would have at least survived longer, and perhaps recovered temporarily. At all events, as the *post-mortem* evidence showed, the case was one that could not satisfactorily respond to surgical treatment alone, but the symptoms of course did not in any way assist in the formation of a correct diagnosis.

ABDOMINAL OPERATIONS IN THE HORSE AND THE SUPPOSED RISK OF PERITONITIS.

By W. STAPLEY, M.D., M.R.C.V.S.,

Professor of Veterinary Surgery in the University of Melbourne, Australia.

THE idea has long been held by veterinarians that the equine peritoneum is so liable to become fatally inflamed when opened as to be beyond the range of practical surgery. It is difficult to see why the peritoneum of the horse should be more liable to peritonitis than the human peritoneum. I am convinced, however, that from the anatomical standpoint surgery on the abdomen of the horse is difficult.

Years ago Farmer Miles entered the peritoneum under crude conditions, and his work was followed by a low percentage of fatal peritonitis. Later, Macqueen has shown that the peritoneum can be opened successfully. Hobday has by long practice refuted the belief that the horse is peculiarly liable to peritonitis. Of course, I understand that instead of writing of peritonitis I should be writing of septic infection, but as *peritonitis* is the term I, in my younger days in England, was taught to dread, I prefer to use it in these notes as an entity, simply as a mark of reverence. I have in England shot, on account of my dread of peritonitis, several "staked" horses. One was a valuable hunter at Dartford with a protruding knuckle of clean, unpunctured bowel, which I now believe should have been saved. The owner of this animal was annoyed with the unreasonableness of a man who was not game to try his best. He had every reason for his

annoyance. There has been too much gun and too much pole-axe in veterinary education of the past.

From September to December, 1909, I performed on the horse a number of abdominal operations, two of which rank as major peritoneal operations, the remainder being of minor major peritoneal operations. This work has been done under conditions not sanctioned by human surgeons, and had similar work been done on the human subject with fatal result it would have been an easy matter to get expert surgical evidence that such work justified a charge of manslaughter. The animals had to be thrown on a dusty tan bed, between two rows of ordinary horse boxes, yet in none of these cases has a general peritonitis been induced. From a clinical or practical standpoint peritonitis has been conspicuous by its absence.

CASE 1.—Three-days'-old foal. Non-closure of the abdominal wall, the skin being in contact with the peritoneum. In the scrotal area a mass, looking somewhat like a cow's udder in size and shape, and chiefly composed of intestines, hung down to the hocks. The floor of the abdomen was absent practically between the umbilicus and the pelvis. At the lower border a patch of skin as large as the hand was completely devitalized, and partly gangrenous. From the xiphoid to the umbilicus a second hernia about six inches long in diameter existed, which, owing to the mass of intestines being in the scrotal hernia, was not tense. The foal was skilfully anæsthetized by Mr. Meyers, veterinary student, using the open method with a mixture of 60 per cent. ether and 40 per cent. chloroform. The area of operation was prepared with hot sterile soda solution, dried and freely swabbed with 1 to 1,000 biniodide of mercury and spirit; my hands were prepared with chlorinated lime and soda; instruments, ligatures, sutures, and gauze were boiled in soda solution. Warm, sterilized normal salt solution was used during the operation. The area of necrosed skin was at once removed, and the sac opened. It then became a difficult task to return the eventrated intestines to the abdomen proper, which, owing to much of the intestines being extra-abdominal, seemed too small for its normal content. In the difficult work I was greatly assisted by Mr. W. T. Kendall, M.R.C.V.S., the father of veterinary teaching in Australia. After the intestines were returned, the mass being retained meanwhile by means of sterilized butter-cloth, the edges of the abdominal wall were brought together by a dozen alternate sutures of silver wire and kangaroo tendon. Because of the unwieldy mass of skin about the hernial sac, and being tired of the operation (I had previously

said the ventral hernia was too large for satisfactory operation, and had only operated for demonstration purposes), I committed the error of doing slovenly surgery on this loose skin, bringing it together imperfectly with silkworm gut sutures. I did not expect the case to rally from the anæsthetic to which it had been subjected for over two hours. It did well, however, and never at any time showed anything but buoyancy of spirits and normal appetite. Of course the skin sac became septic; not, however, until the edges of the abdominal wall had united, and the peritoneum was sealed against infection. The return of the bowels to the abdomen increased the tension of the anterior hernia, and it became very prominent. Twenty days after the first operation we operated on the second, while pus was still oozing from the scrotal wound. Being apprehensive of sepsis, I was induced to use a French depilatory compound of monosulphide of sodium, quicklime, and starch in equal parts on the area to be operated upon. This removed the hair and the superficial epithelium, and we were able to get aseptic healing with the second wound, although the depilatory induced a dermatitis, which scabbed, and ultimately showed small areas of pus beneath the scabs. In this hernia the peritoneum was not opened, buried silver wire was again used, and the skin wound was brought together by subcutaneous silkworm gut suture. A row of silver stitches, therefore, extended, and still extends practically from the xiphoid to the pelvis.

The foal rapidly recovered from the effects of both operations. It developed an excellent appetite and a frolicking disposition. At the present time, three months after the first operation, all that remains to be seen externally is a thickening of the scrotum, the result of sepsis, which I attribute partly to my defective method in not closing the wound properly.

Note.—Peritoneum invaded in every part by my hands. No peritonitis.

Case 2.—Draught horse, aged 2. Cryptorchid right side; umbilical hernia the size of testicle removed from top of inguinal canal; umbilical hernia closed with silver wire and silkworm gut. Uneventful recovery.

Note.—No peritonitis.

Case 3.—Staked, aged cream horse. On December 2 the horse was staked on a picket fence. Result, a jagged wound 15 in. long, tearing pectoral muscles and perforating the abdomen behind the xiphoid. There was extrusion of the colon, which was perforated in three places, one wound being 6 in. long, one 3 in. long, and one

a U-shaped wound, stripping the external coats and leaving the mucosa intact. Free arterial hæmorrhage from colon, spasm of the bowel at intervals, with passage of bowel content. The case reached the hospital fully two hours after the accident. An unsuccessful attempt was made, using cocaine locally, to close the large wound in gut. Then the wound was protected with gauze (unsterilized), cotton and sheeting, and the horse cast as gently as possible—a difficult task successfully carried out by Mr. Hector Kendall, G.M.V.C., with Australian single hock tackle. The horse was chloroformed by Mr. McIndoe, student. Owing to the term being ended, my stock of supplies was incomplete. The wound was cleansed with saline solution and the gut brought further out of the wound to make sure no perforation other than those noted existed. By this time the edges of the bowel wound were œdematous. About an inch on either edge was excised and the wounds closed with No. 3 milliners' needles and boiled linen thread. Connell stitch was used as far as possible. In some places a continuous stitch was used to control the hæmorrhage; in other places Lembert's interrupted stitches were used. At the completion of the bowel work the gut appeared in good condition. It was again washed with saline and returned to the abdomen. The cramped position necessary to adopt in such an operation is to me very exhausting, and I was assisted at this stage by Mr. Lewis, student, who closed the abdominal wall with silver wire and a double drainage tube was inserted. The tags of skin whose vitality was impaired were trimmed off, and the skin wounds brought together with silkworm gut. The abdominal wall was lacerated to shreds, and had it not been for tension we should have excised a large area. The operation lasted one and a half hours, and was extremely tiring to all operators. The horse recovered from the chloroform fairly well and was put on large doses of strychnine subcutaneously. During the rest of the day a fleeting tympanites caused me to push strychnine.

December 3.—Temperature 101·5° F.; pulse 70; respirations undisturbed, bowels acting. Horse anxious for food. Muzzled and given frequent enemata of hot saline.

December 4.—Temperature and pulse normal; respiration shallow. Wound painful; rest of abdomen normal. Salines per rectum; bowels acting freely. Strychnine stopped. Drainage tube now removed (probably it would have been better surgery to have removed it twelve hours after operation). A sagging of the abdomen towards the wound suggested inaction of the recti muscles. Five p.m.,

temperature 100·6° F., pulse 56: respiration shallow. Surface wound becoming fœtid.

Dec. 5.—Temperature 101° F.; pulse 48; respirations shallow, 20 per min. Abdominal wound gangrenous. Skin shows pockets of œdema.

December 6.—Temperature 100·4° F.; pulse 43; respirations 36 and shallow. Horse weary. The wound had now lost its foul odour. Removed a slough of the elastic tissue. Blood count 5,000 leucocytes per c.mm.

December 7.—Temperature 102.4° F.; pulse 60; respirations 40, shallow. Removed the silver sutures and a quantity of necrosed abdominal wall. Colon visible for an area of circle 1½ in. in diameter. Washed out all skin pockets with 1-1000 bichloride. Cleansed bowel with hot saline. Bowels acting fairly well. Packed wound with cyanide gauze and cotton backing and applied a roller bandage, which had a perceptible effect in making the respiration less shallow.

December 8.—Wound discharging freely but looking decidedly better. Temperature 100·2° F.; pulse 46; respirations 44. Horse weary and thirsty, and becoming somewhat emaciated.

December 9.—Temperature 100·5° F.; pulse 47; respirations 40. Wound decidedly improved. The chances of a fæcal fistula forming appeared less. The visible colon has the appearance of being able to put up a successful resistance.

December 10.—Horse fed on damped oats and chaff. Good appetite. Wound doing well. Temperature 102·2° F.; pulse 48; Respirations 40.

December 11.—Appetite good. Temperature 102·2° F.; pulse 46; respirations 40.

December 12.—Temperature 102·2° F.; pulse 46; respirations 40. Horse in good spirits. Abdomen fairly full of food. Passes large stools of a fœtid character, normal in appearance, neither coated with mucus, blood nor pus. Chest percussion normal note. Accumulation bronchial breathing over both lungs. (I am forced to incidentally note that had I used my favourite anæsthetic—ether—I should have said that I had an ether pneumonia. In man it is not a rare occurrence for pneumonia to follow an injury, and if ether has been used it is invariably called an ether pneumonia.)

December 13.—To-day shows a general relapse. Temperature 105° F.; pulse 65; respirations 45. Irritability of bladder, frequent urinations, erections. Good appetite. Bronchial breathing pronounced, also a marked frimitus—not true vocal frimitus, but agreeing in time with the loud bronchial breathing.

December 14.—Temperature 101·5° F.; pulse 50; respirations 45. Horse weary. Eye very bright.

December 15.—Temperature 102·8° F.; respirations short and bad. Bronchial breathing very pronounced. Wound granulating in a normal manner—no pain around its margins.

December 16.—Temperature 102·2° F.: respiration 60. Appetite good. Œdematous swelling round right fore-arm. During day showed fleeting colic. During the dressing of wound the box door was left open and the horse went to the tan bed and rolled in pain; got up and walked back to his box.

December 17.—Temperature 103° F; respiration taxed to its utmost. Loud bronchial breathing all over chest. Percussion note slightly below normal. Horse passed a wretched night. At 10 p.m. colicky pains set in and lasted until 3 a.m.

December 18.—Temperature 102·2° F. Eye bright. Respirations can't be worse. For the first time horse refuses all food and drink. At 10 p.m. left with the idea he could not last the night.

December 19.—Found stiff and cold. *Post mortem*:—Both lungs—acute croupous pneumonia with a few purulent areas throughout. Left lung a patch of diaphragmatic adherent pleurisy. Heart—healthy, containing black and yellow clot. Wounds in bowel completely healed. Contents of bowel normal. Small abscess in abdominal wall. Nonseptic adhesions between colon and edges of parietal wound. Between liver and diaphragm many adhesions of recent origin. Professor Gilruth reports the smears from lung to show enormous numbers of streptococci in a state of purity.

Observations.—This animal died of streptococcic pneumonia, due probably to absorption from the gangrenous area of the abdominal wall. Peritonitis as such was not the cause of death. I believe that had our treatment of the abdominal wall been less conservative we should have occluded the atrium of infection. I am quite satisfied with the healing of the wounds in the colon, for from them no leakage occurred, although the bowel was at the time of *post-mortem* full of ingesta. The infection apparently started in the abdominal wall. At the time of operation this lacerated and shredded area should have been excised and sutures applied to sound tissue. Twice tiredness in myself has forced my surgical judgment and caused me to leave the abdominal wall in an unsatisfactory surgical condition. It is necessary for him who undertakes abdominal surgery in the horse to keep himself in good physical training. Kitchener issued an order in South Africa "that physical exhaustion will not be accepted as an excuse for being

found asleep on picquet duty—all men so found will be shot." He might have added that all veterinary surgeons who get tired whilst operating will fail.

Experimental Work.

Under deep anæsthesia we have endeavoured to find the surgical route into the abdomen. The horse's abdomen, owing to its anatomical formation, is difficult of approach. At present—but we hold the right to change our opinion—we believe the flank to be a bad route, and we think that in spite of weight the ventral areas offer the best approach. Especially do we believe that incisions should study the course of the nerves rather than the fibres of the muscle, and we have been unable to believe from our work that a *gridiron*, or even a muscle-splitting operation, is the operation of choice in the horse. It is more than probable that certain areas of the horse's peritoneum are more vulnerable to septic invasion than other areas. Case 3 suggests that the xiphoid area to which the colon is applied is strong in its resistance to infection. The other operations were in areas of gravitation drainage.

Our work makes it difficult for us to believe that the peritoneum of the horse is particularly liable to peritonitis. A few years back Dr. Fowler, of New York, brought forward what is known as the Fowler position. It is based upon observations on the human peritoneum establishing the fact that certain areas absorb septic products, whilst others do not. The pelvic peritoneum of man being that which is least sensitive to sepsis, he placed his patients in such a position that drainage took place to the pelvis. The principle of this theory has been acted upon by the surgical world, with, it is believed, most gratifying results. It appears to us that the area of least susceptibility of the horse's peritoneum is likely to be in the region of the colon with its myriads of germs, producing in its contiguity an immunity more or less perfect to sepsis. If that be so, the Fowler position for the horse is the standing position, and it at once obviates the disadvantage of the horse being unable to rest on its back. Be that as it may, the only part of the horse's abdomen which lends itself to drainage is the part usually described anatomically as the epigastric area. It is no part of this short paper to enter into a discussion of the vexed question of artificial drainage beyond briefly offering the advice: minimize artificial drainage as far as possible.

PARALYSIS OF THE ANTERIOR CRURAL NERVE.

By E. WALLIS HOARE, F.R.C.V.S.,
Cork.

Subject.—A strong cob, employed for general work, aged.

History.—While drawing a load of bricks, he started to kick, and managed to get the near hind leg over the shaft of the cart.

After some difficulty he was extricated and was found to be very lame.

On examination I found that the animal, while standing, kept the foot level on the ground, but when made to move, just as extension of the stifle was about to take place, he dropped on the affected side and the limb was unable to bear any weight. The action was characteristic of what is known as "dropped stifle." If an attempt was made to lift up the off hind limb, it was found that he could not bear weight on the affected limb.

Treatment consisted in the application of a blister to the region of the stifle and a run at grass for two months. The animal slowly improved and is now working in a trap. A very slight halt can be observed during extension of the stifle, but this does not interfere with his utility.

FRACTURE OF THE PELVIS AND DEATH FROM HÆMORRHAGE.

By P. R. THOMPSON, M.R.C.V.S.,
Market Harborough.

THE subject was a hunter gelding, aged 8, the property of a M.F.H., and at the time of the accident was ridden by the second whip, and was the second horse. After being mounted the animal was walking downhill, and suddenly gave a jump and whipped round sharply, and then went lame on the near hind. The rider dismounted and led his horse about 3½ miles, where he got to a stable and left him there.

I was called to the case, and arrived about four hours after the accident and found the animal down, the inside of the thigh of the affected side being somewhat swollen. I managed to get the animal up and discovered a crepitus over the angle of the haunch, and on making a rectal examination I could still feel the crepitus that I first noticed, but could not ascertain that any other part of the pelvis was affected. I came home to get the slings and on my return found the animal dead, much to my surprise, and the swelling on the inside of the thigh was much bigger.

On making a *post mortem* I discovered a fracture right across the neck of the ileum, the bone being smashed into smithereens, and one edge of the fracture had severed the big arteries of the thigh, causing the hæmorrhage from which the animal died.

Just before death the animal became very violent while down, and this may account for the comminuted fracture, and possibly for the severing of the arteries as well.

CHRONIC ENTERITIS IN A MARE.

By P. R. THOMPSON, M.R.C.V.S.,
Market Harborough.

The subject a hunter mare, aged 7, was always a poor doer. She came up from grass this season, however, looking well. As soon as she was put at work she began to do badly, but was hunted for about half the present season. I was then called in to see the mare, and found that her teeth very sharp, so I rasped them. This occasioned no improvement, and the animal became somewhat jaundiced. I treated her for liver, but although the yellowness of the mucous membranes and fæces disappeared, she still did badly After about five weeks' treatment she began to show signs of colic every now and then, the attacks becoming more and more frequent especially after a meal. I made a thorough examination of the mare but could gain very little information.

The pulse was fair in tone but a trifle slow and dull, the temperature fluctuated between 101° and 103° F. and during the attacks of colic the animal blew a good deal. This uneasiness occurred particularly immediately after feeding. After about ten days I found that the left lung was slighty involved, and after another three days the right lung also, but there was no rise of temperature at the time.

A second opinion was called in and tuberculosis was suggested by my colleague. I tested with tuberculin but got no reaction; the temperature at the time of inoculation however was 102·3° F.

The animal was fed on sloppy food, with gruel, eggs, and brandy, &c., and liquor pepsin and bismuth co. in ounce doses quarter hour after every meal.

A third opinion was then called in; this favoured very much that of the first consultant as to the probable original trouble, but at this period the pulmonary lesions were well established and masked the primary symptoms.

As the mare was wasting away I got permission to destroy her and chloroformed her, telling her owner I considered the case to be either gastritis or enteritis, and incurable.

On *post mortem* I discovered chronic inflamation of the duodenum, which in places was perfectly white and fibrous, all the muscular tissue having degenerated for about the distance of one foot. Other parts of the mucous membrane showed numerous petechiæ, and then a fibruos part again, and so on. There was double pneumonia present, but this was, undoubtedly, secondary to the enteritis.

Canine Clinical Notes.

AN UNCOMMON DENTAL FISTULA IN A DOG.

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.,
Professor in the Royal Veterinary College, London.

THE subject of this note was a young bull-terrier, male, aged 8 months. He was brought to the College Clinique suffering from distemper. Attention was also drawn to a small discharging wound under the jaw, towards the front of the intermaxillary space and inclined to the right side. The history of this wound was to the effect that when the animal was about 4 months old (*i.e.*, about four months previously) his mother rather viciously attacked him, and bit him across the upper and lower jaws. The wounds, however, healed in about a fortnight; but several weeks later a small swelling appeared under the lower jaw and burst, liberating a purulent, blood-stained discharge. It then healed, only to swell up and burst again. This procedure was repeated several times before he was brought to our notice.

On examining the lower jaw we found a puncture that would just admit a small probe, which, when inserted, passed towards the right ramus, against which it could be felt to grate. The diagnosis arrived at was injury to the inferior maxilla, with probable sequestrum formation.

The treatment decided upon was to open up the channel and expose and scrape the bone and remove the dead portion, if it existed; and this was proceeded with under local anæsthesia induced by cocaine. A grooved director was inserted and the opening enlarged with a scalpel, and the depth of the cavity cleansed and further examined. A loose, hard substance could be felt, and was believed to be a piece

of bone. It was firmly grasped by means of a pair of artery forceps and drawn out, and proved to be not bone, but the permanent tush of that side. On referring to the mouth it was found that the right lower tush was missing, and there was no evidence of it ever having pierced the gum. The absence of this tooth had not been previously noticed. The cavity was then curetted and dressed antiseptically with chinosol solution and powdered boric acid. It healed readily, and the patient also recovered from his distemper.

Abstracts and Reports.

THE NEED OF CONTROLLING AND STANDARDIZING THE MANUFACTURE OF VETERINARY TETANUS ANTITOXIN.[1]

BY J. R. MOLLER, V.M.D., AND ADOLPH EICHHORN, D.V.S.,

Bureau of Animal Industry, U.S.A.

OF the various biological products prepared for the cure and prevention of infective diseases in animals tetanus antitoxin has been probably the most extensively used by the veterinary profession. The good effects which were expected from the administration of this antitoxin in the prophylactic and curative treatment of tetanus have not, however, been all that could be desired, and it is surprising to learn of the divergent results which are obtained from its use by various practitioners. It is, therefore, only natural that tetanus antitoxin has not gained the favour of the veterinarian and is not used to the extent merited by such a valuable product. It has been suggested that the lack of uniform results which has followed the administration of the antitoxin is primarily due to the variation in the strength of the product, and, following numerous requests from different sources, it was decided to undertake the standardization of veterinary tetanus antitoxins prepared by different manufacturers, and also to determine whether these products are subject to any variations in strength. This work seemed particularly desirable in view of the address of Anderson before the June meeting of the American Medical Association, in which he stated that his experiments showed veterinary tetanus antitoxin to contain as low as seventeen to twenty-five antitoxin units per cubic centimetre, while similar examinations of antitoxin prepared for medical use contained from 150 units to 600 or even 700 units per cubic centimetre.

This paper is presented with the object of furnishing some concrete examples of the variation observed in tetanus antitoxin at present on the market, and to show the necessity for Federal supervision of all vaccines, serums, antitoxins, viruses, and analogous products, including mallein, tuberculin, anthrax and blackleg vaccine, and hog-cholera serum.

[1] From *Bulletin* 424 of the Bureau of Animal Industry of the United States Department of Agriculture.

Nature and Cause of Tetanus.

Tetanus is an extremely painful disease of all animals, including man, but it more particularly affects the horse, ass, and mule. It is caused by the *Bacillus tetani.* This organism differs from other disease-producing bacteria in the fact that it remains localized at the point of entrance to the body, which is usually through a wound. Here it multiplies and produces a powerful toxin which is absorbed into the circulation and, by acting on the nervous system, gives rise to the symptoms of the disease. From this it will be seen that tetanus is the type of the purely toxic disease and is not transmissible by contact unless the wound containing the germ is discharging pus or blood, as may be the case in tetanus following the operation of castration. Neither can the disease be transmitted from one animal to another by blood inoculation, because no bacilli are circulating in the blood. The bacillus is a spore former, and these spores are very resistant to antiseptics. It can live outside the animal body, and is quite prevalent in garden earth and in the neighbourhood of manure piles. It is an anærobic organism like the bacillus of blackleg, and consequently can multiply only in the absence of oxygen. Deep punctured wounds about the feet and legs are especially serious, as in wounds of this kind the bacilli are most likely to be implanted, and once they have gained access the absence of oxygen in these deep wounds makes the conditions favourable for their growth. The period of incubation varies from a few days to two weeks.

The symptoms come on gradually. There is stiffness of the gait and rigidity of the muscles, the appearance of the animal somewhat resembling a horse foundered in all four feet. The neck is rigid, the head extended, and the tail elevated and immovable. The characteristic symptom of tetanus is the protrusion of the nictitans membrane over the eye when the head is raised. This condition is due to a contraction of the muscles of the eyeball drawing it back into its socket and forcing out the nictitans membrane. There is no other disease in which this condition is present. The animal is extremely nervous, starts at the slightest sound, loses its appetite, and sweats freely. There is a spasmodic contraction of certain groups of muscles, especially those of the jaw, so that the animal is unable to open its mouth, from which the disease derives its popular name of lockjaw. The malady runs an irregular course, and death may occur in a few days, or the affection may be prolonged over two or three weeks. Spontaneous recovery is very doubtful, and the outlook is always grave. The mortality for some classes of animals has been given as almost 100 per cent., while about 75 per cent. of the cases in horses terminate fatally. Unfortunately the disease is seldom suspected until a relatively large amount of toxin has formed and begun to manifest its action in the patient's body.

Historical Summary.

Prior to the discovery of the cause of tetanus there were various theories advanced regarding the character of the disease. One of the most widely accepted views was that tetanus, since it generally develops as a result of an injury, was occasioned by the tearing or contusion of some of the peripheral nerves, and as a consequence the changes produced were conveyed to the spinal cord. On the other

hand, in the cases where no injury was associated with the disease it was thought to be of idiopathic origin.

With the discovery of the tetanus bacillus by Nicolaier in 1884, and its successful cultivation by Kitasato in 1889, the true cause of the disease, which previously had been involved in mystery, was established. Kitasato, in his investigations, also found that the organism is not present in the blood of animals dying of the affection, and, accordingly, he concluded that the fatal results were produced by an intoxication and not by the infection. In his subsequent work with this disease he, together with Von Behring, successfully worked out and published an immunizing method in 1890.

It has already been stated that in tetanus, unlike most of the other infectious diseases, the organism itself does not exert the destructive influence, only the toxins of the organisms being responsible for the serious results of the disease. The tetanus bacilli therefore produce a specific substance which has the toxic effect. Kitasato came to this conclusion in the course of his experiment when he succeeded in producing typical cases of tetanus in mice, guinea-pigs, rabbits, and other animals with the filtrate obtained by filtering tetanus cultures through porcelain filters. At the same time he found that it required only a remarkably small quantity of the toxin to produce tetanus with a fatal termination in these animals.

In the above-mentioned epoch-making work of Behring and Kitasato they attributed the established immunity to the effect of the blood serum, which rendered harmless the toxic substances produced by the tetanus bacillus. From the following described experiments they obtained results demonstrating that the serum had an enormous power of destroying the poison:—

Of a tetanus culture ten days old, which was freed from bacilli by filtration, 0·00005 c.c. was sufficient to kill a mouse in four to six days, and 0·0001 c.c. was sufficient to kill a mouse with certainty in two days. However, 5 c.c. of the serum from the tetanus-immune rabbits were mixed with 1 c.c. of this culture and the serum was allowed to act upon it for twenty-four hours. Four mice were each given 0·2 c.c. of the mixture, which contained 0·0033 c.c. of the culture, or more than 300 times the dose otherwise fatal for mice. All four of the mice remained well. The control mice, on the other hand, died in thirty-six hours after having received 0·0001 c.c. of the fluid. As a result of these and other experiments the authors drew the following conclusions:—

(1) The blood of tetanus-immune rabbits possesses the property of destroying the tetanus poison.

(2) This property is destroyed by the extra vascular blood and the cell-free serum obtained from it.

(3) This property is of such a stable nature that it is also effective in the bodies of other animals, so that we are in a position to accomplish noteworthy therapeutic results by means of the transfer of blood serum.

(4) The property of destroying the tetanus poison is absent in the blood of animals which have not been immunized against tetanus. If tetanus be given to susceptible animals, the toxin may be demonstrated in the blood and other body fluids after the death of the animals.

Tizzoni and Cattain have also established that the blood of

artificially immunized pigeons and dogs has a protective action on mice and rats against the tetanus toxin (1 to 2 drops of the dog serum made 0·5 c.c. of a toxin culture filtrate ineffective).

With these wonderful results as a foundation, the serum therapy of tetanus was established.

The practical application of this method was inaugurated after Schütz had found that horses and sheep can also be successfully immunized against tetanus, and that they produce an active immunizing serum. Horses are now exclusively used for the production of tetanus antitoxin, as large quantities of blood may be drawn from an immunized horse, which constitutes a great advantage in the manufacturing of this product for the market.

The immunizing serum is prepared according to Von Behring's method in the following way: Of 200 c.c. of a virulent bouillon culture, of which 0·75 c.c. kills a rabbit in three to four days, 80 c.c. is mixed with sufficient trichloride of iodine to make a 0·25 per cent. solution; similarly, 63 c.c. is mixed with enough to make a 0·175 per cent. solution, and 40 c.c. with sufficient to make a 0·125 per cent. solution, while the remaining 20 c.c. of the culture is left without any addition. The horse is then injected every eight days, commencing with 10 to 20 c.c. of the greatest dilution and continuing successively with the weaker attenuations of the culture. Finally the pure culture is injected, commencing with 0·5 c.c. and doubling the dose every five days, until no reaction to the culture is manifested and the blood shows the highest number of immunity units obtainable from that individual animal.

Mode of Action of Tetanus Toxin.—The highly poisonous qualities of this toxin and the fact that the organism causing the disease acts only through the generated toxin induced a greater number of investigators to carry out various investigations in connection therewith. The tetanus bacillus, it will be remembered, does not enter the general organism, but remains at the point of entrance (wounds), and only exerts its destructive effect through the action of the toxins which it eliminates. From the place of infection the toxin is conveyed principally by the nerves to the central nervous system, and here is its point of attack. The central nervous system, and especially the spinal cord, is first affected by the toxin, and all functional manifestations of the intoxication, as well as the increased reflex irritability, such as the tonic spasms of the muscles, are the result of the poisoning of the nerve-cells of the spinal cord. That the muscle itself is not directly influenced in its function by the tetanic poison is no longer doubted by pathologists.

The tetanus toxin is taken up by the peripheral nerve endings, and is then conducted by the nerves to the medullary centres, where it combines with the motor nerve cells. The poisoning of these cells then produces the tonic muscular spasms as well as the reflex irritability (Meyer and Ransom, Bruschettini, Stinzing, Von Behring, and others).

The mode of action of the tetanus toxin is explained by Ehrlich's side-chain theory in the following way: Every toxin molecule consists of a non-poisonous (haptophore) aud a poisonous (toxaphore) atom group. On the other hand, the protoplasm of the motor nerve cells consists of a vital nucleus and of numerous side chains (receptors), of which some possess a special affinity toward the haptophore atom groups of the toxin molecules. If molecules of the tetanus poison

enter the nerve cells, they become anchored to the corresponding receptors of the cell protoplasm by the haptophore atom group, and their toxophore group exerts a harmful effect on the vital nucleus of the cell. There follows either a total destruction of the cell protoplasm as a result of this combination or a stimulation of the cell protoplasm to defensive action which is manifested by the continued production and elimination of the receptors into the blood. The presence of these free receptors in the blood of immunized animals explains the antitoxic immunity, since these receptors are enabled to combine with the haptophore atom of the toxin molecule before it has had an opportunity to attack the cell of protoplasm.

The tetanus toxin, according to Ehrlich, contains at least two poisons, the tetano-lysin and the tetano-spasmin. He showed that on the relative proportions of these poisons depends whether toxin has stronger tetanic properties and a weaker hæmolytic action or vice versa.

Toxicity of Tetanus Toxin. Testing the tetanus toxin for its virulence, Kitasato found that 0·0002 c.c. of the filtrate of a tetanus culture proved fatal to a mouse, while 0·002 c.c. killed a guinea-pig weighing 560 grm. A rabbit, on the other hand, required relatively double the quantity of the mouse and almost seven times as much as the guinea-pig, since it required 0·04 c.c. of the filrate to kill a rabbit weighing 1·490 grm. Accordingly, of these three species of experimental animals the guinea-pigs are the most susceptible to tetanus toxin, mice coming next and rabbits last. Of all animals the horse is probably the most susceptible to this toxin.

The remarkable poisoning qualities of tetanus toxin can be seen from the finding of Briszer and Cohn; 0·00000005 grm. of their strongest tetanus toxin killed mice weighing 15 grm. Smaller doses, as 0·00000001 grm., caused tetanic symptoms in mice. The minimal lethal dose (MLD) of the standard tetanus toxin of the Hygienic Laboratory of the United States Public Health and Marine-Hospital Service is 0.000006 grm. for a guinea-pig weighing 350 grm.

Stability of Tetanus Toxin. Kitasato was the first to make extensive tests on the stability of the tetanus toxin, and while other investigators have since undertaken similar work with it the results they have obtained merely confirmed the findings of Kitasato.

In experimenting upon the effect of physical influences on the filtrate, Kitasato found that tetanus toxin is quite susceptible to heat. Subjected to 65° C. and above, it is totally destroyed in five minutes, while it resists 60° for fifteen minutes, but twenty minutes' exposure to this temperature destroys it. The drying of the filtrate does not necessarily destroy its virulence. However, a great deal depends upon the method of drying, as for instance, if dried in the incubator it is entirely destroyed, while if dried in the exsiccator over sulphuric acid or in the air at room temperature it retains its virulence. Exposure of the filtrate to diffused light showed a gradual diminishing effect upon its toxic action; however, it requires a long time before its virulence is entirely destroyed, as the filtrate which had been exposed for nine to ten weeks to the diffused light in the window still had toxic effects in large doses. On the other hand, the filtrate retains its virulence for a very long period if kept cold in a dark room, since it did not lose any of its virulence after three hundred days under such conditions. Exposure of the filtrate to direct sunlight proved that it

is entirely destroyed only after fifteen to eighteen hours, while shorter exposure showed a corresponding diminution of the toxic action of the filtrate. Dilutions of the filtrate with water or bouillon do not influence the virulence of the tetanus poison.

Of the chemical influences on the filtrate Kitasato found that tetanus toxin is very susceptible to the action of acids (especially mineral acids) as well as alkalies.

Practically the same results were obtained by Rosenau and Anderson regarding the stability of the tetanus toxin, and as a result of their extensive investigation with the dried toxin they found that it not only retains its virulence when kept in a cold, dark place, but loses its toxicity quite slowly when exposed to light, heat, and other influences. One sealed tube sent from Washington to Manila by mail arrived there without appreciable loss of toxicity. The stability of the dried toxin is of great advantage in the work of standardization of the antitoxins, as it assures accurate work and also simplifies and expedites the tests.

The Standardization of Tetanus Antitoxin.

European Methods.—With the establishment of the principles of immunizing against tetanus by Von Behring and Kitasato, it became necessary to adopt a method by which the potency of the antitoxin could be accurately determined. In Germany the testing of the tetanus antitoxin is carried out in accordance with the Von Behring method, which provides that normal serum shall be a serum of which 0·1 c.c. renders ineffective 0·03 grm. of normal toxin. This normal or test toxin is a dried toxin, 1 grm. of which has a virulence capable of killing 10,000,000 mice, each weighing 15 grm. The Italian method of standardizing tetanus antitoxin is based on the work of Tizzoni and Cattain. The toxin unit, according to this method, is the smallest amount of toxin which will kill a rabbit weighing 1 kilogram in from four to five days. The Tizzoni antitoxin contains 80,000 immunity units in every cubic centimetre; in other words, this amount of antitoxin will neutralize 80,000 toxin units.

The French method of standardizing tetanus antitoxin is carried out by the subcutaneous inoculation of a series of guinea-pigs with quantities of serum equal $\frac{1}{500000}$, $\frac{1}{1000000}$, $\frac{1}{1500000}$, &c., of their weight. Twenty hours later these test animals are given a single fatal dose of toxin, and the immunizing power of the serum is then considered to be $\frac{1}{500000}$ or $\frac{1}{1000000}$, &c., dependent upon whether the animal receiving this proportional weight of serum has survived the toxin which proved fatal to the control guinea-pig.

The American Method of Standardization.—The method of standardization which was carried out in connection with the testing of the veterinary antitoxins as reported in this paper followed the exact lines of the method known as the American method, which has been adopted officially under the biological product act of July 1, 1902.

This method, which is the result of several years' work on this subject in the Hygienic Laboratory, is a highly creditable achievement by Rosenau and Anderson,[1] as it not only simplifies the standardiza-

[1] Rosenau and Anderson. The standardization of tetanus antitoxin. *Bulletin* 43, Hygienic Laboratory, United States Public Health and Marine Hospital Service. Washington, 1908.

tion of this valuable serum, but is also perfectly reliable in its accuracy. The method was also unanimously adopted by the Society of American bacteriologists subsequent to the report made by a special committee.

In this method the immunity unit for measuring the strength of tetanus antitoxin is fixed so that it shall be ten times the least quantity of antitoxin serum necessary to save the life of a 350-grm. guinea-pig for ninety-six hours against the official test dose of a standard toxin furnished by the Hygienic Laboratory of the Public Health and Marine Hospital Service.

Thus it is required from the manufacturers of the "human" tetanus antitoxin to state the number of units their products contain, which not only insures serum of reliable strength, but also establishes a uniformity among the producers of tetanus antitoxin in America. On the other hand, the antitoxins destined for "veterinary" use are still under no control whatsoever; there is no uniformity in the method of standardization, and the potency of the product is absolutely left to the honesty of the manufacturer. This state of affairs, of course, does not assure the veterinarian of any uniformity of the product even of the same manufacturer, still less of different manufacturers. Only one of the different veterinary tetanus antitoxins on the market states the number of American units the immunizing or curative dose contains. The others fail to make any declaration, and in one case the number of units is given in the hundred thousands, whereas the human antitoxin of the same firm of course complies with the requirements of the law, stating definitely the number of American units that particular antitoxin contains. These conditions alone should suffice to point out the necessity for supervision of this veterinary product and the establishment of uniformity among the producers of veterinary antitoxin. It is very essential that the veterinarian should have some assurance of the strength of the antitoxin upon which his standing as a professional man may depend.

Examination of Commercial Veterinary Antitoxins.

The samples of tetanus antitoxin (veterinary) which were standardized in connection with this work were obtained from various drug stores in Chicago, New York, and Washington. They were kept at a temperature from 50° to 60° C. until the tests were made, care being taken not to expose them to any condition which might affect the potency of the antitoxin.

The toxin was obtained from the Hygienic Laboratory of the Public Health and Marine Hospital Service through the courtesy of Surgeon-General Walter Wyman, and represented the dried standard toxin which is used in the standardization of tetanus antitoxin in the Hygienic Laboratory and furnished to the manufacturers of antitoxin. In the determination of the value of the antitoxin the L + dose is the test dose of the toxin. The L + dose is the smallest quantity of tetanus toxin that will neutralize one-tenth of an immunity unit, *plus* a quantity of toxin sufficient to kill an animal in just four days. The L + dose of the toxin which was used in these tests contained 100 minimal lethal doses (MLD) for a 350-grm. guinea-pig. The toxin was kept in a dark, cold place, and during the course of these

tests its virulence was controlled by repeated tests with an antitoxin of known value.

The guinea-pigs used in connection with this standardization were carefully selected, being vigorously healthy animals of from 350 to 370 grm. in weight. The glassware employed in the work was selected according to the recommendation of Rosenau, and was not used for any other purpose. The mixing cylinders and mixing flasks were the kind designed by Rosenau. Ehrlich's delivery pipettes, graduated into hundredths, as well as special delivery and capacity pipettes, were used. The syringes employed were a modification of the old Koch syringe, in which the barrel tapers gradually to the needle, so that the last drop runs out readily.

The necessary measures against bacterial contamination were taken during the execution of the work. All the glassware was first rendered chemically clean and then sterilized for one hour at 120° C. All the various steps in the procedure were followed carefully in order that the results would be accurate and reliable. The method of the standardization was executed in every particular as described by Rosenau and Anderson in *Bulletin* 43 of the Hygienic Laboratory.

The number of immunity units contained in a cubic centimetre of serum is determined by the quantity of antitoxin which saved the life of a guinea-pig for ninety-six hours against the official test dose of the toxin. This quantity of antitoxin represents one-tenth of an immunity unit. For instance, if a guinea-pig receiving 0·0015 c.c. of the antitoxin with the official test dose of toxin is saved for ninety-six hours, this quantity of antitoxin contains one-tenth of an immunity unit. Accordingly, the following equation is represented: $0{\cdot}0015 : 0{\cdot}1 :: 1 : x$, which indicates that 1 c.c. of the serum contains sixty-six units.

Following are given the results of the standardization obtained from the tests of the various samples of veterinary tetanus antitoxin examined in this laboratory[1]:—

No. 1.—H. K. Mulford Company's tetanus antitoxin serum for veterinary use. Immunizing dose, labelled to contain 500,000 units. To be exchanged after May 1, 1910. Laboratory No. 2,960. Syringe contained 7·6 c.c. On testing, the number of antitoxin units per cubic centimetre was 81, and the total number in syringe, 615.

No. 2.—Parke, Davis and Co.'s antitetanic serum (veterinary). To be exchanged after November 24, 1910. Unit value not stated. Syringe contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 125, and the total number in syringe 1,250.

No. 3.—H. K. Mulford Company's tetanus antitoxin serum for veterinary use. Immunizing dose, labelled to contain 500,000 units. To be exchanged May 15, 1910. Laboratory No. 2,960. Syringe contained 7·5 c.c. On testing, the number of antitoxin units per cubic centimetre was 81, and the total number in syringe 607.

No. 4.—Pasteur Laboratories, Paris, France, antitetanic serum for veterinary use. Unit value not stated. Bottle contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 100, and the total number in bottle 1,000.

[1] In the original article tables are included giving full details of the experiments conducted in these tests.

No. 5.—Lederle Antitoxin Laboratories, tetanus antitoxin (veterinary). Immunizing dose, labelled to contain 1,500 units. Laboratory No. 19A. To be exchanged June 21, 1910. Syringe contained 10·4 c.c. On testing, the number of antitoxin units per cubic centimetre was 154, and the total number in syringe 1,601.

No. 6.—Parke, Davis and Co.'s antitetanic serum (veterinary). To be exchanged after December 8, 1910. Unit value not stated. Syringe contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 125, and the total number in syringe 1,250.

No. 7.—Parke, Davis and Co.'s antitetanic serum (veterinary). To be exchanged after December 8, 1910. Unit value not stated. Syringe contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 125, and the total number in syringe 1,250.

No. 8.—Parke, Davis and Co.'s antitetanic serum (veterinary). To be exchanged after January 14, 1911. Unit value not stated. Syringe contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 100, and the total number in syringe 1,000.

No. 9.—H. K. Mulford Company's tetanus antitoxin serum for veterinary use. Immunizing dose, labelled to contain 500,000 units. To be exchanged after May 15, 1910. Laboratory No. 2,971. Syringe contained 8 c.c. On testing, the number of antitoxin units per cubic centimetre was 59, and the total number in syringe 472.

No. 10.—Pasteur Laboratories, Paris, France, antitetanic serum for veterinary use. Unit value not stated. Bottle contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 111, and the total number in bottle 1,110.

No. 11.—Pasteur Laboratories, Paris, France, antitetanic serum for veterinary use. Unit value not stated. Bottle contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 153, and the total number in bottle 1,530.

No. 12.—H. K. Mulford Company's tetanus antitoxin serum for veterinary use. Immunizing dose, labelled to contain 500,000 units. To be exchanged after May 1, 1910. Laboratory No. 2,960. Syringe contained 7·5 c.c. On testing, the number of antitoxin units per cubic centimetre was 81, and the total number in syringe 607.

No. 13.—Lederle Antitoxin Laboratories, tetanus antitoxin (veterinary). Immunizing dose, labelled to contain 1,500 units. Laboratory No. 19A. To be exchanged June 21, 1910. Syringe contained 8·5 c.c. On testing, the number of antitoxin units per cubic centimetre was 232, and the total number in syringe 1,972.

No. 14.—Pasteur Laboratories, Paris, France, antitetanic serum for veterinary use. Unit value not stated. Bottle contained 10 c.c. On testing, the number of antitoxin units per cubic centimetre was 153, and the total number in bottle 1,530.

The results of these tests clearly demonstrate the variations in the potency of veterinary tetanus antitoxins at present on the market. While the preparations of the individual manufacturers do not show such marked differences in strength, yet they do not uniformly contain a sufficient number of units.

In accordance with the (United States) law of 1902, the manufacturers of human antitoxins are required to state on the labels of the packages the number of units that the particular antitoxin possesses. Should it be found on investigation that the antitoxin does not come

to within 10 per cent. of the strength stated on the labels, the manufacturer is immediately required to recall from the market all that particular antitoxin. Thus, if a physician intends to use the antitoxin either for immunizing purposes or as a curative agent, he is accurately guided in the dose by the statement on the label. It does not matter who the manufacturer of the antitoxin is. This latter fact is in itself also of great importance, as frequently the drug stores carry antitoxins of only one or two manufacturers.

On the other hand, the veterinarian has not always the good fortune of knowing the number of units that an antitoxin which he purchases contains. Only one of the manufacturers states on the label the number of American units contained in his veterinary antitoxin. One other manufacturer still uses for his veterinary antitoxin a standardization—other than American—by which he can label his product in the hundred thousands, yet his antitoxin for the human gives the units in the American standard. Why should two different standards be maintained, one for the human and the other for veterinary antitoxin?

The veterinary tetanus antitoxins are marketed in immunizing doses and curative doses. The immunizing dose is supposed to contain 1,500 American units. The volumetric quantity of this dose was found to be accurately 10 c.c. in the Parke, Davis and Co. and the Pasteur product, while the Lederle serum contained from 8·5 c.c. to 10·4 c.c., and the Mulford syringe from 7·5 to 8 c.c. Now, should it be desired to administer to a horse an immunizing dose of the antitoxin, it can readily be seen from the results obtained in these tests, as indicated by the tables, that while the immunizing dose of some of the serums contains the desired 1,500 units, others, on the other hand, possess less than one-third of that strength. For instance, according to the test shown by No. 9, the syringe contained 8 c.c. of serum, with fifty-nine units per cubic centimetre; thus the immunizing dose in this case represents only 472 units, and of course the curative dose is correspondingly low. This alone is sufficient to indicate the urgent necessity for some uniformity in standardizing the veterinary antitoxins, and also for Federal legislation by which they could be subjected to a periodical control with reference to their potency.

Under the present conditions there is the constant uncertainty regarding the strength of the serum, as the veterinarian has no assurance whatever of its potency, and is solely dependent on the reliability of the manufacturer.

Conclusions.

(1) The veterinary tetanus antitoxins prepared by the different manufacturers have not a uniform potency, and the variation amounts in some instances to about two-thirds less than the strength which it should possess.

(2) In order to insure a uniform strength, the manufacturers of veterinary tetanus antitoxins should be required to use the American standard, and to state on the label the number of American units the dose contains, as is required for human tetanus antitoxin.

(3) The immunizing dose for a horse should contain at least 1,500 immunity units of the standard established by the United States Public Health and Marine-Hospital Service.

(4) It is seen that the veterinary tetanus antitoxins vary extravagantly in the unit strength, and some are comparatively weak in antitoxic potency, which shows the necessity for the same supervision by the United States Department of Agriculture over biological products used in veterinary medicine as is now exercised by the United States Public Health and Marine-Hospital Service over similar products used in human medicine.

(5) The request for such supervision should have the endorsement of the veterinarians and live-stock interests of this country.

COLONIAL VETERINARY SCIENCE.[1]

By Dr. ARNOLD THEILER, C.M.G.,

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When your Principal, Professor Mettam, wrote to me some months ago in South Africa, knowing of my forthcoming visit to Europe, and asked me to give you an address on the subject of Colonial Veterinary Science on this occasion of the opening of the new term of your College, I at once made up my mind to avail myself of this kind invitation, should time permit me to do so, which I am happy to say it did.

There were several reasons why I was pleased to accept his invitation so readily. Firstly, I wished to see the country from which several of my South African friends have hailed, men both in and out of the profession, who have proved to be such excellent colonists. Secondly, to make the acquaintance of men whose names were familiar to me through the good work they had done in the past. Thirdly, because it gave me the opportunity for the first time in the British Isles, to lay before a scientific and appreciative audience an *exposé* of a special branch of our science, namely, the Colonial Veterinary Science, and, by enabling me to draw attention to its importance, of demonstrating the necessity of giving it more attention at the veterinary colleges of the home country.

In speaking of Colonial Veterinary Science I do not mean a science exclusively peculiar to the colonies. Science is always the same, whenever and wherever it may have to be made use of; I apply the term rather to certain peculiarities of stock diseases met with in the colonies, and to the conditions under which they have to be dealt with, conditions which to a great extent differ from those found at home, and vary much according to the state of civilization of the different colonies. In this respect the colonies of Great Britain offer a multitude of variations; but the basis of all colonial enterprise is the development of a colony's own resources. This is a principle which, in the past, has invariably been applied by the British people in the administration of their over-sea possessions, and this is the secret of success. One of the resources—and in most colonies the main one—is the breeding and rearing of live stock. In most of them this forms the main occupation of the farming population. Stock are reared for

[1] An address delivered on the occasion of the opening of the new term of the Royal Veterinary College, Dublin, October, 1909, Sir C. J. Nixon, Bart., in the chair.

the purpose of providing working animals and for the production of milk, butter, and cheese, both for home consumption and for export, sheep and goats for their wool and mohair, almost exclusively for export, and without exception, in all colonies domesticated animals, whether horses, oxen, camels, or elephants, are made use of for transport, and form in this respect the first medium for the development of a country. Yet when we look back into the early history of some of the colonies, or when we look at the existing conditions in others, especially in the tropical African possessions, we find that owing to plagues and diseases of stock colonial enterprise severely suffers.

On the other hand, when we look at the progress made in the stamping out of diseases by State regulations in Europe, more especially in the British Isles, and particularly in this country, we are struck by the fact that the experience gained here did not induce the administrative authorities to proceed similarly in the colonies. It is true enough that the conditions are different, and the diseases to a great extent also differ. This is, however, not an excuse to leave things in abeyance or to consider the natural course of events inevitable, when such a vital interest as the speedy development of a country is at stake. It is further true that in the past Colonial Veterinary Science stood helpless at the approach of a new plague, and this will to some extent still be so when a new one arrives. This was due to the want of proper knowledge, which could not and cannot be gained without experience, research, and experiments. The duty of a colonizing government is, therefore, to offer such facilities as will tend to the organization and maintenance of institutions where these unknown and new diseases can be studied. The knowledge thus gained forms a base of all prophylactic measures undertaken either individually by owners of stock, transport riders and farmers, or by the administrative authorities through their organized veterinary staffs. In this respect South Africa, and especially the Transvaal, offers an example worthy of emulation by the home and other Colonial Governments, inasmuch as by inaugurating a veterinary department with an efficient staff, it has maintained and encouraged scientific research, and finally has built a modernly equipped laboratory at an expense of about £80,000, exclusively for the study of animals' diseases, and towards the maintenance of which an annual contribution of about £30,000 is granted.

All prophylactic measures against diseases have the one ultimate object in view, namely, eradication; to effect this a thorough knowledge of etiology is necessary, which can only be gained by research. There are plagues which can be successfully dealt with when they are made the subject of legislation and placed under proper control, and this is possible even in a colony where a mixed community of civilized and non-civilized people live, as has been repeatedly proved by the experience in South Africa.

For the purpose of making you more fully acquainted with the plagues and diseases existing in the colonies, I wish to dwell in the first instance on Africa, which in this study is closely related to India, or perhaps it would be better to say Asia, and I shall take the etiological moment as guide for further deliberations. We may distinguish two great groups of plagues or diseases, namely, directly contagious

and indirectly contagious ones. Under the term "directly contagious" we understand a disease for whose propagation the presence of sick animals is required, or of their products bearing the causal agent of the disease in the shape of micro-organisms commonly called virus. It will be useful to introduce an expression which is frequently used in the diseases peculiar to the Tropics, namely, the term "reservoir of the virus," meaning an animal carrying the infection. When applied to the directly contagious diseases the sick animal itself is the reservoir of the virus, the source of all contamination. Speaking now more particularly from a South African point of view, we do not know of any directly contagious disease specific for that country which has not occurred or is not still present in other parts of the world. Indeed, all directly contagious plagues were at one time or another imported into South Africa, and they are all more or less cosmopolitan. We have to consider rinderpest, pleuro-pneumonia, glanders, epizootic lymphangitis, tuberculosis, scab, anthrax, and quarter evil. The etiology of these plagues has principally been worked out in Europe, with the exception of rinderpest, the scientific study of which on modern lines may be claimed by South Africa. But it is not my intention to repeat here the micro-biology of the diseases mentioned. This must be familiar with the practitioner and the older student, and the younger generation will hear about it in due time; it is rather my intention to show how they were and how they are still dealt with in the African sub-continent.

In this group of diseases the source of all infection, the reservoir of the virus, is the sick animal. Its removal and destruction is, therefore, the main object. To this principle we all agree, both here and in Africa. In the means to achieve it we differ.

Some years ago rinderpest swept down broadcast over the whole sub-continent, killing thousands and hundreds of thousands of cattle in its progress; then, after the checking of its advance had proved futile, the immediate idea was the saving of the greatest number possible of the cattle that were exposed to infection. The farmers tried to save as much stock as was possible under the existing conditions, and were quite willing to bear a share of loss. This idea of saving whatever you can by means of inoculation or curative treatment does not apply to rinderpest only, but to any disease which comes suddenly and causes a great mortality, and this idea is not at all a peculiarity of the South African farmer, it is characteristic of almost any farmer wherever he is; it was, however, particularly pronounced in South Africa, where there had been no previous history of State-aided combatting of diseases, and the farmers had to rely on their own individual efforts and resources. But even now the old principle of saving the greatest number of animals either infected or exposed to infection is still the primary object of all action, and is adhered to wherever possible; indeed, it comes simultaneously into consideration with the ultimate object of the total eradication of a plague. Thus two objects have sometimes to be combined, one which seems to defeat the other. The following notes may illustrate what is meant:—

In rinderpest, for instance, the destruction of the virus is essential; we achieve this either by killing the sick and susceptible animal or by rendering the latter immune; the former method is the old one of

Europe, where probably even now it would be the only right thing to do; the latter is our method. You will be aware that two forms of immunity are distinguished, active and passive; the active immunity is obtained by actually passing an animal through a mild attack of the disease, from which it recovers. In rinderpest this is achieved by means of the injection of bile, or the simultaneous inoculation of protective serum and virus; the passive one renders the animal temporarily unfit for any infection; it is obtained by the injection of protective serum alone. The former usually lasts as long as immunity acquired under natural conditions; the latter of comparatively short period.

By rendering an animal actively immune it temporarily becomes a reservoir of virus, and thus creates and maintains a new source of infection. Thus, by using this method as a means of combatting a plague in the first instance, the creation of a large source of infection is caused, and this may be responsible for the further spread of the disease. On the other hand, the injection of serum alone does not spread disease; the protection may, however, not last long enough to outlive the period of infection. The application of either method, or a combination of both, depends entirely upon the existing conditions and on the immediate object in view; they are usually combined, and the success in stamping out the disease, and at the same time saving the greatest number of animals, depends largely on the men who have to judge which method should be adopted in each case, and what other precautions should be taken.

We also make use of active immunization in the stamping out of pleuro-pneumonia; this method is totally condemned in Europe, and I may say quite rightly. Experience in Europe has proved that not only the sick animal, but also the apparently recovered animal—in other words the chronically sick animal—acts as reservoir of the virus. For a successful stamping out of the disease its destruction is, therefore, essential. In Africa, we recommend the slaughter of every animal, but we have the experience, especially in the Transvaal, that the "lunger" does not play such an important *rôle* in the propagation of the disease as is accepted in Europe, otherwise we would not have been able to deal so successfully with this disease as we have done in the past. Here, also, our immediate object is to save the greatest number of animals by rendering them immune, which, of necessity, must stop all further propagation of the disease once complete immunity is obtained. The method consists in the subcutaneous inoculation of virus in the tail, either in the form of the pleuritic exudate or the pure culture. Gentlemen, it will perhaps surprise you to hear that in the Transvaal, in the way indicated, we have been able to clear the country of all rinderpest, and of all pleuro-pneumonia. The former disease has completely disappeared from South Africa; it is still lurking in the far north of Africa. The latter one is still present in some colonies, and is occasionally imported into the Transvaal. Its final eradication from South Africa is in view, even from native territories, where close supervision is a very difficult matter.

With regard to glanders, we make use of the approved method of Europe by tracing the infection to its source, ascertaining the affected animals, principally by means of Mallein, and destroying the reservoir of the virus. In this respect Mallein has rendered us immense assist-

ance, and its utility can in no way be demonstrated better than by informing you of the fact that, for instance, in Rhodesia, glanders has completely disappeared, after all animals reacting to the test were killed, and now only such animals are allowed to be imported as have passed the test and are found free from infection. Progress is, however, general in South Africa, and the time is not far off when a similar state of affairs in other Colonies can rightly be expected.

The principle of destroying the infected animal is also largely applied in the combatting of epizootic lymphangitis, although we allow the treatment of cases which are not badly affected.

Tuberculosis is not yet met with amongst the native cattle of Africa; lately, however, it has made its appearance amongst pure-bred and cross-bred animals of imported stock. We endeavour to prevent its spread by the destruction of infected animals and the control of importation. Here, also, we make use of the approved method of Europe, namely, tuberculin, but we are looking forward with equal eagerness as yourselves to a better method. This the more so, as the judging of thermal reactions in animals of tropical and sub-tropical countries, both after Mallein and tuberculin injections, may form a source of grave errors, sometimes due to the inconsistency of the normal temperatures of the animals, caused by unsuitable surroundings and external conditions. Accordingly, contingencies have to be taken into consideration which are negligible in this country. For instance, the use of tuberculin in tracing the disease in the half-wild cattle of Madagascar, where, in the southern part, the disease is prevalent, is quite hopeless.

In anthrax and quarter evil the approved methods of Europe are also successfully made use of, and for the protection of the exposed animals recourse to vaccinatian is largely taken. The destruction of the infected cadaver is, however, not always an easy matter, and there is still room for devising a method of disposing of cadavers where burning or burial is not possible, as is so often the case in the dry parts of Africa. Great assistance in saving the largest number of exposed animals is found in the vastness of the African veld. Herds can be moved out of the infection, so that further mortality stops. Luckily anthrax plays a relatively small *rôle* as a devastating disease. Quarter evil, however, is fairly prevalent, but it is successfully dealt with by inoculation, a method fully approved of by our farmers.

Scab is the sore point of the African veterinary surgeon, and we are a long way from arriving at the happy position of our sister colonies, Australia and New Zealand, where the disease has completely disappeared. It is not for the want of proper knowledge how to combat it; the colonies mentioned have given the example how it can be done; it is rather due to the fact that the local conditions and the custom of shepherding and trekking into summer and winter veld makes a complete control somewhat difficult. However, in the Transvaal there exists a great wish to clear the country of scab at all costs, and for this purpose large sums of money are spent.

The second group of diseases with which we have to deal in Africa is that of indirectly contagious ones, where an animal can only become infected by means of an intermediate host, the host being either a tick or an insect. These are the diseases which are commonly called the tropical ones, and although they are not exclusively typical for the

Tropics, they are nevertheless the most prevalent ones, which is probably due to the fact that in warm climates the transmitting hosts find the best conditions for their existence. All these tropical diseases are, without exception, diseases of the blood, the micro-organisms either attacking the corpuscles, such as the piroplasms, or living in the blood-stream, such as trypanosomes or spirochætes. In this group have also to be included some very important maladies caused by invisible or ultra-visible and filterable micro-organisms.

Let us consider, first of all, the tick-borne diseases. To these belong redwater, caused by *P. bigeminum*; an infection due to *P. mutans*: the formidable East Coast fever, which has caused so much damage in South Africa, due to *P. parvum*; the biliary fever of horses, due to *P. equi*: the biliary fever of dogs, due to *P. canis*; and the spirochætosis and the heartwater of ruminants, this latter caused by an ultra-visible organism. From a prophylactic point of view an important fact comes into consideration, namely, that an animal, after recovery from the disease to which it has become immune, can act as a reservoir of the virus, and as a source of constant infection from which the transmitting host, the tick, obtains the virus, which it inoculates in turn into susceptible animals. This fact is the cause of the permanent infection of the African veld with some of the tick diseases, and the reason why it is so difficult to keep the susceptible imported animal alive. The diseases in which the immune animal acts as a reservoir of the virus are inoculable with the blood of such animals, with the exception of heartwater, of which only the sick blood, and of East Coast fever, of which neither the sick nor the immune blood is infective. In order to understand the *rôle* of the tick as a carrier of the infection the knowledge of its life-history is important.

In the biology of a tick we distinguish the adult stage, in which both sexes are met with. The female lays an enormous number of eggs, usually amounting to several thousand; the eggs hatch into larvæ, these engorge and moult into nymphæ, these again engorge and moult into adults. Some of the ticks require one host only for the completion of their life-cycle, as, for instance, the blue tick, *Boöphilus decoloratus*; others require two hosts, such as the red tick, *R. evertsi*, which changes from larva to nympha on the animal, and from nympha to adult off the animal; a third group requires three hosts, all three stages undergoing their moults underground; to this belóngs the group of the brown tick. According to these characteristics, the infection is transmitted either through the larva, having been taken up by the adult female and passed through the egg. Such is the case in *P. bigeminum* and *Spirochæta Theileri*, which are both transmitted by blue ticks. *P. equi*, the cause of equine biliary fever, is transmitted by the adult stage of the red tick, after it has become infected in the nymphal stage; *P. mutans* and *P. bigeminum* may be transmitted by the same stage of this tick. *P. parvum*, the cause of East Coast fever, is transmitted by the brown ticks (*Rhipicephalus appendiculatus, simus, capensis,* and *nitens*) in the nymphal or adult stage, after the infection has been obtained in a previous stage. In this disease it has been proved beyond doubt that the infection does not pass through the egg. Heartwater is transmitted by the bont tick, *Amblyomma hebræum*, in nymphal and adult stages. *P. canis*, the cause of canine biliary fever, is transmitted by the adult stage of the tick after it has been taken up by the

adult stage of the previous generation; the intervening larvæ and nymphæ, although infective, are not able to communicate the disease.

It is of the utmost importance to know the exact length of time the various ticks require for their hatching and moulting, and how long the life of the various stages lasts, because on this knowledge depends the possibility of extirpating them by starvation, and accordingly, at the same time, of the disease also. For instance, a successful interference in a case of East Coast fever lies in the fact that the responsible tick dies out within about fourteen months, after which time it is quite safe to restock an infected farm. Based on the knowledge of the length of the various stages the brown ticks require for their moulting, it is possible to undertake a successful removal of cattle exposed to infection by passing them through into a non-infected area, keeping them there during a certain period, when all the infected ticks will drop, and moving them out on to fresh ground before these ticks have moulted and have become ready to re-attach themselves. These intervals have been so timed that during the period of the first stage of the movement all infected animals are detected, in the second stage the clean ones are out of the infection, and by fencing the infected farm a guarantee is given against the reintroduction of cattle, so that the infection must of necessity die out.

Diseases in which the immune animal acts as a reservoir would be dealt with in a similar way, and the Americans have applied these principles towards the successful eradication of Texas fever. Under African conditions, however, a procedure for the eradication of diseases, the reservoir of which is the immune animal, is not yet possible, and at present not even advisable. With but a few exceptions the whole country is infected with piroplasmoses, and attempts to eradicate ticks would be futile. It is therefore advisable to make use of the existing immunity obtained from inoculation for the protection of susceptible animals. This can be done in redwater and equine piroplasmosis; the blood of an immune animal acts as a vaccine, and although this method is quite successful for African-born susceptible animals, it is not yet perfected for imported ones. It seems to me that the cause of the failure lies to a great extent in the fact that in the inoculation of blood of an immune animal, usually not only the piroplasm under consideration is transmitted, but also other inoculable and deadly diseases. One of these we are actually studying at present, and here indeed is room for more research. Country-born animals do not suffer much from these piroplasmoses; calves and foals as a rule easily recover, and remain immune for the whole of their lives through constant exposure to tick infection; it is the imported animal that dies, and herein lies the difficulty of improving the native breed of stock in the various African colonies.

To the sub-group of insect-borne diseases belong those transmitted by flies; one genus in particular, the *Glossina*, comes principally into consideration, and the diseases transmitted are due to one genus of blood parasite, namely, trypanosomes. This statement, however, only holds good for Africa; in other parts of the world *Glossinæ* are not known, yet there are trypanozoonoses, as these diseases are called. There are quite a number of species of trypanosomes described in Africa, of which the most important are *T. Brucei*, the cause of nagana; *T. dimorphon*, the cause of perhaps the most widely spread

fly disease in Africa, and some more which are not yet sufficiently determined. What is known concerning the maintenance of the infection in the case of the piroplasmoses applies also to the trypanozoonoses. The animal which has recovered from the disease and is considered immune may act as a reservoir of the virus. In the case of nagana—game principally comes into consideration as such—the fly acts as a transmitting agent from the reservoir to susceptible animals, and at one time it was thought that this transmission was purely a mechanical one, the fly playing merely the *rôle* of a simple inoculator; but for protozoological reasons and in analogy with the mosquito-carried malaria of man and the tick diseases, it began to be surmised that within the fly a certain development of the trypanosomes takes place. This has now lately been proved to be the case; it was found by Professor Kleine, and it has been supported by Bruce, that an infection can be carried by a fly, not only in a mechanical way when the trypanosomes appear after an incubation time following the date of biting, which corresponds to a simple inoculation, but after a much longer period, thus indicating that in the meantime the trypanosome develops in the body of the fly before the bite was infective.

There are several species of tsetse-fly, and the habits of all of them are not the same or yet fully known. Accidental experience has shown that in the case of some fly diseases man could successfully interfere; for instance, in South Africa the disappearance of nagana was subsequent to the destruction of game, and in this way rinderpest, which was the cause of the decimation of the larger species of game, was at the same time the cause of the disappearance of the fly diseases. It must, however, be understood that this does not hold good for all trypanosomes, and probably not for all species of flies. Fly life is to a great extent dependent on the bush, and the destruction of the bush is followed by the disappearance of the fly. But this remedy is only feasible to a limited extent, and therefore for a rational and effective prevention of trypanozoonoses a great field of research is still open.

Other insect-borne diseases may be summed up in the South African horse sickness and catarrhal fever of sheep, or, as it is commonly known, blue-tongue. For epidemiological reasons night insects must be considered as carriers, and therefore mosquitoes are suspected. Experimentally it has not yet been proved which species is responsible, a work which has yet to be undertaken. The fact has been demonstrated, however, that the exclusion of all insect life by means of insect-proof stables affords protection to the animals. These two diseases, horse sickness and blue-tongue, are seasonal diseases, depending to a great extent on the annual rainfall, and such tedlurical conditions as are favourable for the development of insect life. We only know as yet that with the blood of recovered animals we cannot transmit the disease artificially, and on epidemiological grounds we must accept the theory that some reservoir exists, which is likely to prove to be some other species of animal. It must be the work of further investigations to find this reservoir, and should it be found it will then perhaps be an easy matter to eradicate it, and with it the disease. In the meantime use of other means has to be made to combat the diseases, or at least to save the greatest number of the animals exposed to infection. This is done by making use of the immunity resulting after recovery from the disease. We have intro-

duced a sero-vaccination which protects mules against horse-sickness to a great extent, but we have not yet been able to save the same number of horses. Also against blue-tongue in sheep we have introduced a successful vaccination which protects highly, and which permits of re-stocking farms where on account of blue-tongue they had become uninhabitable for sheep. In the case of horse-sickness in horses various degrees of susceptibility and of immunity offer a very complex problem which can only be solved by numerous experiments.

A fourth group of diseases is due to intestinal parasites, and in this respect sheep sometimes suffer so severely that in certain parts successful sheep farming is impossible. Here is a further opening for research, especially into the biology of these parasites for the purpose of successfully interfering from a prophylactic point of view.

Finally, it is incumbent on me to inform you what is not generally well known in Europe, that there are diseases met with in Africa amongst stock of all kinds which are not yet properly known or studied, and against which we are as yet helpless in advising definite means of treatment. I need not mention the names, it is sufficient to state our present helplessness and the necessity for further research, demonstrating to you the possibility of solving great problems.

From my notes on Colonial Veterinary Science, I hope to have been able to show you the importance of the subject, both from the economic as well as the scientific point of view, and therefore the necessity of giving it as much attention as it deserves in the veterinary colleges of Great Britain and Ireland.

You will have seen that in order to be a successful investigator into tropical diseases a careful study of various subjects is required, amongst which I could mention parasitology, and particularly protozoology, as well as a thorough knowledge of tick and insect life generally. In the field of pathology a practical study of the blood lesions is essential, since nearly all tropical diseases are diseases of the blood, and for the purpose of the prevention of diseases and for the immediate help and saving of animals, the principles of vaccination and serum therapeutics are essential.

It is the duty, gentlemen, of you who are the governors of this institution to see that facilities are offered to give full attention to these problems, and of you who are the professors and teachers to enter thoroughly into them in your lectures. For you who are students it will be wise if you follow such lectures with the greatest care. The colonies require only the best of good men, and for such a great future is possible.

At the combined show of the Great Dane and Borzoi Clubs, held at the Crystal Palace on April 19 and 20, Mr. A. Cornish-Bowden, M.R.C.V.S., was selected for the position of judge of the Great Danes. His popularity amongst exhibitors of this variety, together with his reputation for fairness and knowledge of the points of the breed, gained for him no less than 391 entries, a record which has never been excelled, either in London or Berlin.

Miscellaneous.

UNIVERSITY OF LONDON.

APPOINTMENT OF EXTERNAL EXAMINERS IN VETERINARY SCIENCE.

Professor Sir John McFadyean, C.M., M.B., B.Sc., LL.D., has been appointed External Examiner in Veterinary Pathology, and Professor G. A. Buckmaster, M.D., B.Ch., D.P.H., External Examiner in Veterinary Physiology, for the year 1910-11.

ROYAL VETERINARY COLLEGE.

ELECTION OF EXAMINERS, 1910.

Membership Examination--Class A.

Anatomy.—W. Robb, F.R.C.V.S.; John Blakeway, F.R.C.V.S.

Chemistry and Physics.—H. Somerville, B.Sc., M.R C.S., L.R.C.P.; J. M. H. Munro, D.Sc., M.R.C.S., F.I.C., L.R.C.P.

Biology.—W. E. Agar, M.A., D.Sc., Fellow of King's College, Cambridge; W. B. Bottomley, Ph.D., M.A., F.L.S., F.C.S., Fellow of King's College, London.

Class B.

Anatomy.—H. G. Bowes, F.R.C.V.S.; W. E. Ison, F.R.C.V.S.

Histology and Physiology.—* E. P. Cathcart, M.D., D.Sc.

Stable Management, &c.—H. J. Dawes, F.R.C.V.S.; W. S. Mulvey, F.R.C.V.S.

Class C.

Morbid Anatomy, Pathology, and Bacteriology. — H. C. Reeks, F.R.C.V.S.; E. J. McWeeney, M.A., M.D., F.R.C.P.I.

Materia Medica, Practical Pharmacy, Therapeutics, and Toxicology.—James Peddie, F.R.C.V.S.; J. McL. Young, F.R.C.V.S., F.R.S.E., F.Z.S.

Hygiene and Dietetics.—W. Woods, F.R.C.V.S.; Henry Taylor, F.R.C.V.S.

Class D.

Veterinary Medicine and Meat Inspection.—W. H. Bloye, F.R.C.V.S.; N. Almond, F.R.C.V.S.

Veterinary Surgery and Obstetrics.— W. Hunting, F.R.C.V.S.; R. J. Hickes, F.R.C.V.S.

Fellowship Examination.

Veterinary Medicine and Surgery.—J. Macqueen, F.R.C.V.S.
Hygiene and Sanitary Science.—W. Hunting, F.R.C.V.S.
Pathology and Bacteriology.—J. Malcolm, F.R.C.V.S.

The examiners hold office for a period of three years.

* Another to be appointed.

Translations.

A CASE OF DIAPHRAGMATIC HERNIA.

By Dr. STEINBERG.
Gelsenkirchen.

On August 12, 1909, I was called at 12 o'clock in the night to see a horse with the following history: At 7 o'clock in the evening the horse slipped when turning in the stall, and fell down. He immediately got up again, had one hour's work in a light waggon without showing anything abnormal, and was brought in again. At 8 o'clock he had eaten up his supper, and was put to work again. On the way back, about 10 o'clock, the driver found that the horse would not trot. He was walked home, and then showed, when stabled, all the symptoms of colic. The owner thereupon gave him a draught of "anticolicum." He dunged several times. When I arrived I found a light draught horse, aged about 10, with head depressed, and in a very apathetic state; there was strong in- and expiratory dyspnœa; at times groaning. Mucous membranes of the eyelids, looked at by lamplight, were pale. Pulse scarcely perceptible, irregular, and beating about 100 to the minute. Temperature not taken. The horse turned on his back, then lay on his side, sprang up, and then went down, and for some time assumed the dog-sitting posture. Whilst noticing him there were only slight colicky symptoms. Peristalsis was quite audible on both sides. On rectal examination the bowel was filled with loose dung, but nothing special was noticed.

An unfavourable prognosis, with probably an early death, was given; but, since the owner wished treatment, an arecolin injection was made and coffee administered. The pulse then became stronger. Death occurred at 2 a.m.

Post mortem on the morning of August 13: On opening the abdominal cavity nothing special was noticed in the intestines. The stomach was stretched and filled with masses of food. On the peritoneal surface of the liver there were a few small blood-clots. On removing the liver one noticed at the spot where the tendinous portion of the diaphragm merges into the muscular part, on the right side and in the upper third, an opening about as long as one's finger, in the partition through which a loop of the small intestine had gone into the thorax; this loop of intestine, about 1½ metres, was easily drawn back into the abdominal cavity. The edges of the rent were torn and covered with coagulated blood. The serosa of this piece, with the corresponding mesentery, was diffusely reddened and sharply defined from the remaining pale yellow-coloured bowel. The mucous membrane was swollen. The contents of this section were a thinish, dirty yellow-coloured fluid and much gas. Except for some filamentous efflorescences on the pleura pulmonalis there was nothing abnormal.

The rupture of the diaphragm doubtless resulted from the fall. The passing through of the intestine occurred after taking food, and perhaps the full stomach helped it. The chief symptoms *intra vitam* were: Strong dyspnœa, the depressed head, and the high frequency of the pulse, and slight colic appearances.

(*Berliner Tierärztliche Wochenschrift.*)

HYGIENIC PRODUCTION OF MILK.[1]

BY MONSIEUR BRENET.

Veterinary Health Department, Seine.

Cowhouse.—The building, spacious, well lighted, well ventilated, in a perfect state of cleanliness, contains two rows of animals facing each other, but separated by a large service passage. Mangers of fortified cement have all their angles rounded, but are not separate. Walls cemented only up to a height of about a foot and two-thirds from the ground are carefully washed every day in their lower parts, and frequently limewashed for the rest of their extent.

Several movable tubs placed in the cleaning passages, which are also very wide, are destined to receive the excrements in proportion to their evacuation. The litter is plentiful, and renewed every day.

Isolation House.—A two-stall shippon, entirely independent of the cowhouse, is used to place fresh cows in; they remain there until the attendant veterinarian has declared them to be healthy. After arrival they are submitted to the tuberculin test; those that react are immediately returned to the would-be seller.

In this isolation building the cement mangers are separate; all the angles of the walls are rounded, the floor is strictly impermeable, without any breaks in it. The walls are cemented up to a height of 6 ft. 6 in. The cubic air space is considerable; the lighting and ventilation are exceedingly good, leaving nothing to be desired.

Choice of Animals.—The number of cows in the large house is twenty-one (twenty Normandy and one Flemish). They are all young and in perfect condition. Their price varies from between £25 and £33, and they are only kept six months in service. At the end of this time the dealer takes them back for a sum hardly equal to half the price at which they have been sold.

Ration.—Beetroot and all distillery and brewery residues are rigorously excluded from the feeding. The ration of a cow for one day is composed as follows: Fine maize meal, 4 lb. 6 oz.; barley meal, 2 lb. 3 oz.; lentil meal (at 10d. a kilogramme), 2 lb. 3 oz.; bran, 6 lb. 9 oz.; potatoes, 17 lb. 9 oz.; park hay, 22 lb. The cost of the food per day and cow comes out at about 4 francs, or 3s. 4d.

Milking.—Twice a day in a special well-fitted edifice, to which the animals are conducted in turn. The milkers, two in number, put on overalls specially cleaned each day. They wash the udder of the cow with tepid water and soap, then, after rinsing with fresh water, they spray the mammary region with oxygenated water with a vaporizer. They carefully wash their hands and put them in oxygenated water before proceeding to milk.

Manipulation of the Milk.—The milk is put into a large funnel of nickeled copper communicating directly with a cooler in the storey below. Filtering takes place through a cotton-wool disc fixed in a special way at the entrance of the apparatus.

Before each milking the cooler is carefully washed in boiling water, then sterilized with steam at 105° C. A very ingenious apparatus installed in the washhouse permits the obtaining of fresh boiling water at will, and steam under pressure.

[1] Visit to an establishment operating in the environments of Paris.

Washing Bottles.—Bottles destined to receive the milk are at first washed in carbonated baths at 80° C., are afterwards rinsed automatically in hot water, then sterilized by steam at 105° C.

Placed immediately in metallic boxes closing hermetically, they are put on a rack in the vicinity of the cooler. Immediately after filling the bottles are corked with a metallic capsule fastened to the edges of the neck by a mechanical catch.

This operation of corking costs about 4 centimes a bottle, but by a special arrangement on opening the bottle the capsule is ruptured into three parts, which cannot be put into position again, and render the covering of no further use.

This feature prevents all frauds which could be made by the deliverers of the milk to the prejudice of the establishment. The dairy sells the greater part of the milk in Paris, where it is sent by rail. The price of a litre ($1\frac{3}{4}$ pints) has not been given to us; it should vary between 1 and 2 francs.

(*L'Hygiène de la Viande et du Lait.*)

PROLONGED ANÆSTHESIA BY A MIXTURE OF OXYGEN AND ETHYL CHLORIDE.

By PIERRE ROSENTHAL and ALB. BERTHELOT.

Ethyl chloride can only be used as a general anæsthetic in operations of short duration. When narcosis has to be prolonged it can only be effected by copious inhalations frequently repeated. Rosenthal and Berthelot thought it would be possible to prolong narcosis indefinitely by associating oxygen and ethyl chloride. The authors have been able under these conditions to maintain anæsthesia for nearly an hour, and to practise the most varied operations on animals. Narcosis is very rapidly obtained, and awakening is very prompt. Ethyl chloride has the advantage of not associating with operation shock the inconveniences of ether and chloroform.

(*Revue Générale de Médecine Vétérinaire.*)

INFECTIOUS BULBAR PARALYSIS IN DOGS.

By LAUFER.

Allatorvosi Lapok.

At a farm three dogs fell ill in the space of two days with the following symptoms: Strong salivation, rubbing of the head against neighbouring objects. Death occurred at the end of the first day of illness.

Autopsy disclosed no lesion in the organs. A rabbit inoculated under the skin with a piece of the spinal cord of one of the dogs was ill for two days and a half, and later showed typical trouble. A cat which ate the flesh of the rabbit was found dead nine days later.

The author has previously reported two great enzootics of the same disease in dogs which died at the rate of four or five a day.

(*Revue Générale de Médecine Vétérinaire.*)

Books and Periodicals, &c., Received.

Bulletins of The Bureau of Sleeping Sickness; Bureau of Animal Industry, U.S.A., 25th Annual Report; Report of the Municipal Veterinary Surgeon for Glasgow; The Commercial Motor; Journal of the Royal Army Medical Corps; Proceedings of the Royal Society of Medicine; Agricultural Journal of the Cape of Good Hope; Report of the Department of Agriculture for the Dominion of Canada.

Letters and Communications, &c.

Dr. Ebbitt; Professor Mettam; Mr. Kendal; Mr. P. R. Thompson; Mr. F. Bullock; Mr. A. N. Trotter; Entomological Research Committee; Mr. Douglas; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Messrs. Burroughs, Wellcome and Co.; Mr. P. J. Howard; Mr. Gelvin; Mr. J. G. Rutherford.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Bailliere, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

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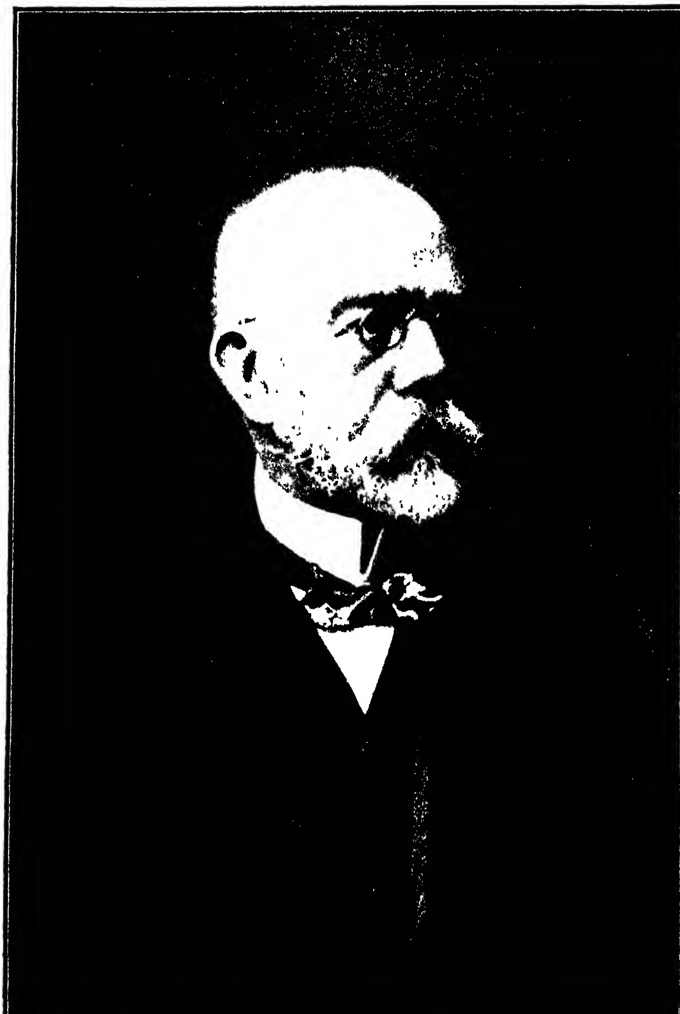

HIS EXCELLENCY ROBERT KOCH.

THE

VETERINARY JOURNAL

JUNE, 1910.

THE LATE DR. ROBERT KOCH, 1844-1910.

THE world of science, and in fact mankind in general, has sustained a severe loss by the death of Dr. Koch, which has occurred at Baden-Baden from heart disease. Robert Koch was born at Klausthal in Hanover, being one of a family of thirteen, and, adopting medicine as a profession, he took his degree at the University of Göttingen in 1866, and after a while engaged in private practice at Posen. When the Franco-Prussian War broke out he volunteered as a medical officer, and afterwards was appointed health officer at Wallstein. It was here he seriously commenced his bacteriological researches, finding himself in a country where anthrax was very rife. In 1876 he was able to prove definitely that anthrax was due to a specific bacillus. Pasteur had preceded him by some years in establishing the germ theory of disease in connection with silk-worm disease. As the result of his early work Koch formulated certain postulates which were destined to be adopted by all bacteriologists, These conditions, which he considered ought to be fulfilled before an organism could be definitely regarded as the cause of a given disease, were: (1) The organism must be found within the tissues of the animal; (2) the organism must be capable of cultivation in suitable media outside the animal body; (3) the pure culture must be capable of producing the disease in question when inoculated into a susceptible animal;

and (4) the organism must be again found in the inoculated animal.

Dr. Koch's next great triumph was his discovery of the tubercle bacillus in 1882, and it is in this connection that he is best known in this country. It is impossible to estimate the enormous amount of work he did in tuberculosis and that he made possible as the result of his various researches. Much of his work on bovine tuberculosis was done in collaboration with Professor Schütz, of the Veterinary High School of Berlin. He introduced tuberculin, which has proved such a boon to veterinary surgeons in the diagnosis of tuberculosis. His startling statements at the London Congress in 1901 were directly responsible for the appointment of the second British Royal Commission on Tuberculosis, which has done so much excellent work and reported against Koch's views. Other diseases investigated by him are cholera, plague, and sleeping sickness in men, and piroplasmosis and rinderpest in cattle.

In 1904 Dr. Koch was provided by the German Government with a modern laboratory, and was freed from his teaching duties to devote his whole time to research. He possessed the Order of Merit (Germany), and the Kaiser conferred on him the title of Excellency. He was a Fellow of the Royal Society of England, and in 1905 he received the Nobel Prize for Medicine. Koch's name will be handed down to posterity, and will rank with such names as Pasteur, Virchow, and Lister.

Editorials.

THE LATE KING EDWARD VII.

THERE is no body of men in the whole of the British Empire more sincerely loyal than that comparatively small body which comprises the veterinary profession. Hence the news of the death of King Edward VII. came to us individually and collectively as a terrible shock, causing us the deepest heartfelt sorrow. So much has been said and written of King Edward that little is left for us to say, but we are certain that every member of the Royal College of Veterinary Surgeons will sincerely endorse the action of our Council as reported elsewhere in this issue of the VETERINARY JOURNAL. The words of our President will be echoed in the hearts of all members of the profession, and we owe him thanks for so adequately expressing our deepest sympathy with the sorrowing Royal Family.

Above all things, veterinary surgeons like a man to be a man and a sportsman. Edward VII. was a veritable "king of men and of sportsmen," and as such he appealed to us almost as much as by his broad, human sympathies and his incomparable statesmanship. As an agriculturist, too, the late King occupied a leading position, exhibiting and frequently winning at various agricultural shows, and so stimulating the breeding of good stock. He modestly described himself as "a farmer on a small scale." He was a good shot but a better yachtsman, and an enthusiastic motorist. It was, however, in connection with his racehorses that his sportsmanship reached its culminating point. He won the Derby three times—twice as Prince of Wales, with Persimmon in 1896, and with Diamond Jubilee in 1900—but the crowning achievement of his racing career came last year, when for the first time a reigning monarch carried off the coveted Blue Riband of the Turf with Minoru. Few of us will ever forget the wild excitement and cheering when Minoru was led into the Enclosure by its Royal owner. The crowds cheered and cheered until they could cheer no more. Only on the day of his death his horse Witch of the Air won at Kempton. It may not be known to many that when Prince of Wales he also tasted the delights of the winning

jockey when riding his own horse Rupee in a steeplechase at the Curragh. Although such an ardent supporter of the Turf, Edward VII. loathed gambling. In a letter he once wrote to Archbishop Benson, the following occurred :—

"I have a horror of gambling, and should always do my utmost to discourage others who have an inclination for it, as I consider that gambling, like intemperance, is one of the greatest curses which the country could be afflicted with.

"Horse racing may produce gambling or it may not, but I have always looked upon it as a manly sport which is popular with Englishmen of all classes; and there is no reason why it should be looked upon as a gambling transaction. Alas! those who gamble will gamble at anything."

Our loss is undoubtedly a great one, but that of his immediate family is of necessity far greater. We offer to them our humble sympathy and condolence, and we are thankful that our beloved Queen Alexandra and the other members of the Royal Family have been able to sustain their severe bereavement with such fortitude.

KING GEORGE V.

WHILE mourning our loss of King Edward we have one great consolation, and that is that he left us such a worthy son to take up his work. While Prince of Wales, our new King had not the same opportunities of becoming famous and popular as his illustrious father had, but he made more than excellent use of his opportunities, and of late years was rapidly gaining the love and confidence of those destined to become his subjects. King George V. is the most widely travelled of all monarchs, and possesses more intimate knowledge of Britain beyond the seas than any of his predecessors. To all parts of the Empire he is a known personality, not merely an honoured name.

As a sportsman our new King is second to none, though he has not been able (owing, we believe, to a wish of his father) to take such a part as he would have wished on the Turf. He has inherited all his father's instincts in this direction, and now that he

has also become the owner of his father's famous stud we shall see him develop in his true light. Veterinary surgeons and sportsmen in general are glad to know he intends to maintain that stud, and to know that agriculture and breeding will receive the same support as of old.

King George ascends the throne with high hopes attaching to him, and we trust that his reign may be a long and prosperous one. We fervently echo the words uppermost in the hearts of all loyal British subjects, and say "*God Save King George V.*"

INSTRUCTION IN ZOOTECHNY.

THE recommendation of the International Congress that special lectures and demonstrations in this subject should be included in all veterinary curricula is one that will meet with general approval. It is highly necessary that veterinary surgeons should know the distinguishing features at least of the different breeds of live stock, as well as their uses, the most favourable conditions for their existence, &c. Especially is such a general knowledge necessary for the veterinary surgeon who desires to to emigrate to the Colonies, whether he become engaged there in either State service or private practice, and for that reason the Melbourne Veterinary Faculty arranged special lectures and demonstrations in this subject for the student's last year. Now it has been decided to make zootechny a special subject of the third and fourth years, and the student will be specially examined thereon.

Through the courtesy of the Minister of Agriculture for Victoria, arrangements have been made whereby the necessary instruction will be given by the special experts who are already engaged in the departmental service as general instructors in such subjects to the farming community of the State.

Many of the Continental schools have already a completely organized course of lectures in their curriculum, and the subject is one of the greatest importance. It is time that the English veterinary schools attended to this matter, as if placed early in the course it

would do much to make the first or second year student of value to the practitioner with whom he locates himself during the vacation; for nothing annoys or disgusts a client more than to hear a young fellow make mistakes in what are to him (the client) common facts of everyday life. The Melbourne University School may be congratulated here, as also on the Doctor of Veterinary Science Degree, on the lead they have given to the old country.

THE TREATMENT OF TETANUS.

We make no apology for reprinting from the *Lancet* an account of the treatment of a case of tetanus in a man by means of subcutaneous injections of solutions of sulphate of magnesia. Other cases have been previously reported in man of treatment by intraspinal injections, a series of cases with a large proportion of successful results have been recorded in the Proceedings of the Royal Society of Medicine.

We are not aware of this line of treatment having been adopted in our patients, but, as the treatment of tetanus in horses is at present so unsatisfactory, it might be well worthy of a trial. The intraspinal method is not practicable, but we have little doubt as to the practicability of the subcutaneous injections. The sulphate of magnesia is said not to affect the toxins as they are produced, but it is said to control the spasms and so conserve the patient's strength until he has had time to form his own antitoxin.

If any of our readers should see fit to adopt this line of treatment, we should be glad to hear the results, be they successful or otherwise.

General Articles.

ANTITUBERCULOUS VACCINATION IN THE OX.[1]

By M. S. ARLOING.

Professor at the University, Director of the National Veterinary School at Lyons.

General Preliminary Considerations.

My first trials with antituberculous vaccination go back to the year 1884, when I showed that the virus contained in so-called scrofulous lesions was relatively weakened to that of the greatest part of visceral tuberculoses. I renewed them in 1896-98 after having profoundly modified the virulence of the tubercle bacillus of man up to the point of having made from it a bacillus deprived of the property of occasioning tubercles, save in the peritoneum, with weak or medium doses.

These two series of trials had appeared to be checks because they had been carried out on the rabbit, and the vaccination experiment had been made by the inoculation of a dose of very virulent bacilli relatively much stronger.

Pursuing my studies on the variations of the virulence of the bacilli of tuberculosis, I soon convinced myself (1) that it was possible *to obtain* a whole gamut of bacilli more or less attenuated in their virulence; (2) that it was possible *to find* varieties whose inoculation in ruminants in particular, and by certain ways, did not set up tuberculous lesions. Also at the moment when von Behring announced at Stockholm that he could vaccinate calves, I had already in hand some experiments of vaccination with very weak human bacilli, cultivated by ordinary processes on solid media.

I indicated the results obtained in this kind of vaccination at Milan in December, 1904, at the opening of the experiments of control of the bovo-vaccination of von Behring, undertaken by la Société de Médecine Vétérinaire, practised and directed by M.M. Rossignol and Vallée. These results show that one communicates a strong resistance in young animals of the bovine species by intravenous injection of weak human bacilli maintained in ordinary culture. Unfortunately, increased resistance is not always obtained without *minimal* lesions appearing, whose final disappearance is not always certain.

Antituberculous Vaccines.—Since 1894 I have particularly applied

[1] Ninth International Veterinary Congress at the Hague, September, 1909.

myself to vaccinating with bacilli, of which I have modified the tubercle-producing property by accustoming them to live in homogeneous cultures in the depths of bouillon, glycerinated to 60 per 1,000. It would take too long to record here my lengthy and patient researches to create varieties of bacilli of human and bovine origin by a series of cultures in the depth of bouillon at different temperatures and pressures (they may be found in the records of the Academy of Sciences of Paris, 1898 to 1906. See also Congress of Hygiene held at Berlin in 1907, and Congress of Tuberculosis held at Washington in 1908. I will only mention the essential points in the circumstance.

After having taken fixed characters in new conditions, when one has made them live and propagated them, these bacilli no longer produce the classic tuberculosis of the rabbit and guinea-pig when introduced under the skin or into the veins.

One would believe at first that these bacilli are absolutely deprived of the property of determining tuberculosis. But if one pushes the injection in the peritoneum one obtains tubercles in the great epiploon and the perigastric glands. Hence the tubercle-producing characteristic has not entirely disappeared.

But if one injects ½ c.c. of culture into the veins of a rabbit, the liver, the lungs and spleen, in spite of normal external characters, present lesions recalling those of the Yersin type which one generally attributes to avian bacilli. The liver is very remarkable in this instance. These lesions bordering tuberculous inflammation are in the liver: now simple infiltrations of mononuclear cells, again mononuclear cells and some giant cells without reciprocal order. In the spleen there are epithelioid cells, some giant cells disseminated without order to the interior or outside of the follicles, or one notices an alteration of the protoplasm and of the nucleus of the cells of the follicles. If the dose of bacilli injected has been very weak, infiltration of round cells is very sparse, and one can hardly distinguish them from infiltrations of the same kind which can be met with in the liver of a rabbit pure from all inoculation.

An important point to remember in these small animals is that alterations do not evolve towards a typical tuberculous lesion, they persist in their primitive state however long the subjects survive after injection. The sequelæ are still more interesting in ruminants, notably oxen. When one injects the bacilli as above modified into the blood of ruminants, in the dose which one injects into the rabbit (¼ to ½ c.c.), the probable lesions are so infinitesimal that it is ordinarily impossible to discover them in the young of the bovine species.

With Stozzi and Fernand Arloing I have encountered strongly suspicious points on histological section. But these points comprise starred cells indicating that they are being called upon to transform themselves into fibrous tissue, that is to say, to follow the process of cure of tuberculosis.

I found, therefore, in my possession races of human and bovine bacilli,[1] transmissible in successive cultures, and living well, which do not determine tubercles in a dose of ½ to 1 c.c. in the veins, and which reabsorb themselves very easily into the organism without danger to man in case of accidental inoculation. In fact, they are bacilli containing all the qualities that one could wish for to undertake vaccination of the ox.

As a *résumé*, since 1904, all my experiments in the vaccination of ruminants have been made in the following manner: (*a*) Immunization with the bacilli of human and bovine mammifers in homogeneous culture; (*b*) test of immunized subjects with virulent bacilli of bovine origin in culture on solid media.

Methods of Immunization.

I have tried immunization by three ways: subcutaneous, intravenous, and digestive. The vaccinated subjects have been tested with bovine bacilli, inoculated by one or other of these methods, sometimes by cohabitation with a very advanced tuberculous subject.

I have varied the mode of immunization, for it was important to know the most efficacious and easy to apply. And in order to appreciate more surely the value of this or that method of vaccination, I have tested the vaccinated subjects in several ways, and generally in a severe fashion. The virus employed in the trial inoculations was always tested simultaneously on the rabbit and guinea-pig. Finally, some calf controls were inoculated with the trial virus in sufficient number to give all possible credence to the result. A certain number of subjects had to be sacrificed in determining the doses to employ in each method of vaccination, particularly in intravenous injection.[2]

Sixty subjects of the bovine species, all aged 4 months at least

1 These bacilli of human or bovine origin are so well modified that they are tolerated by the monkey in the digestive tube or under the skin; they would be then probably devoid of danger to man.

2 The successive results of my experiments may be found related in the Proceedings of the French Association for the advancement of science, Congress of Lyons, 1906, and in the records of the bureau of scientific researches, Ministry of Public Instruction, years 1904, 1905, 1906, 1907.

and a year old at the most, have been devoted to vaccination experiments proper. They have been accompanied by thirty controls of the same species.

(1) *Technique for Vaccination by Intravenous Injection.*

(*a*) *First Immunizing Inoculation.*—Injection into the jugular of ½ c.c. of a culture of bacilli (human or bovine) aged about a month.

(*b*) *Second Immunizing Inoculation.*—Injection of 1½ c.c. into the same vessel two months later. If dealing with an animal of large size one should give 1 c.c. at the first injection and 1½ c.c. at the second. Subsequently immunity may be continued by subcutaneous inoculations of 2 c.c., made in the neck and flank from year to year.

(2) *Technique for Vaccination by the Subcutaneous Method.*

(*a*) *First Vaccinal Inoculation.*—Injection of 2 c.c. of culture under the skin of the neck, and of 2 c.c. under the skin of the flank (right side).

(*b*) *Second Vaccinal Inoculation.*—(Two months later) 2 c.c. of culture under the skin of the neck, 2 c.c. under the skin of the flank (left side). Immunity may be continued by renewed inoculations of 2 c.c.

It is superfluous to recommend all aseptic precautions in the application of the two first procedures.

(3) *Technique for Vaccination by Ingestion.*

(*a*) *First Vaccinal Ingestion.*—15 c.c. of the culture are deposited in the mouth on the sides of the tongue by fractions of 1 to 2 c.c., with the aid of a 20 c.c. syringe. After each partial injection the animal should be allowed to swallow at its ease.

(*b*) *Second Vaccinal Ingestion.*—20 c.c. of culture will be deposited in the mouth, following the same procedure. Immunity can be reinforced and continued by subcutaneous injections of 2 c.c.

PHENOMENA FOLLOWING VACCINAL INOCULATIONS.

There is one phenomenon common to all methods of vaccination. I refer to the temperature-raising effect of tuberculin injected under the skin. Animals which do not react before the first inoculation, react in a characteristic fashion a month after inoculation, a proof that they have undergone tuberculous infection. Consecutively this sensibility diminishes little by little in the greater part of the subjects, often it remains doubtful. It ascends after the

second vaccinal inoculation ; nevertheless, the reaction is a little less strong than that following the first inoculation.

If one injects tuberculin into the vaccinated animals six or eight months after the second immunization, the reaction is very often negligible. It, however, produces successively in vaccinated animals some modifications which render them less and less apt to react to tuberculin. These phenomena unfold whilst the bacilli spread in the organism, and become destroyed there unostentatiously without creating perceptible lesions.

To these common phenomena may be added troubles peculiar to intravenous and subcutaneous vaccination. I shall not speak of immunization by ingestion, for its sequelæ pass unperceived.

In *intravenous vaccination* the first injection does not cause early general troubles. But towards the middle of the second week the temperature rises some tenths, it may reach and even pass 40° C. This hyperthermia is quite ephemeral, reappears sometimes in the subsequent weeks without the health appearing disturbed by it The second injection is followed on the contrary by immediate disturbance. The subject becomes dull, has a staring coat, eats less, is sometimes slightly tympanitic, and at the end of the day the temperature rises to 40 C. and above : but it descends rapidly on the following days, and everything returns to the normal.

In *subcutaneous vaccination* there is immediately produced at the point of the first injection a slight diffuse œdema, which soon becomes circumscribed, less and less sensible, and finishes by being hard and bossellated to the touch.

As a general rule this tumefaction persists a very long time, always becoming reduced. If one incises it at the end of a year to eighteen months, one finds it composed of an envelope of sclerous connective tissue, in its centre some yellowish granulations, partially softened and of a purulent clotty material. This local accident never, however, tends to ulceration of the skin. One can, and must, leave it to itself, for it is probably the situation of an elaboration of vaccinal material. The corresponding lymphatic glands swell and become sensitive for some time, then retake their volume and normal consistence. The temperature hardly rises a few tenths. The general state is excellent.

The second immunization is followed generally by a local accident analogous to the preceding, at times a little less extensive. Usually the temperature rises during the first day, but the general state is not so accentuated as that which follows the second intravenous injection. Subsequently there can be no doubt that the animals have received

a dissemination of tubercle bacilli, and carry four foci in which some bacilli exhaust themselves.

Inquiry into the Results.

There are two ways of investigating the results of immunization:—

(1) One can content oneself with observing the vaccinated and control subjects clinically. One can see, for example, that several experimental subjects will present an abnormal temperature, and that certain of them will present symptoms of pulmonary tuberculosis. But many among them, after a very troubled period, return to a quite normal state at the end of the experiment. In fact, inoculation does not always produce a generalized or subacute tuberculosis, but limits itself to provoking a subacute or chronic pulmonary tuberculosis, or here and there circumscribed lesions, that is to say, what I will call a partial infection. The vaccinated animals will at times be as severely affected as the controls. The great majority appear, on the contrary, to bear up well clinically. In proclaiming from this sign the complete success of vaccination, one should not deceive oneself by calling the subcutaneous injection of tuberculin to one's aid. Examples have been recorded (by M. Lignières among others), and I myself have noted cases where the reaction to tuberculin was at fault, in spite of the presence of tuberculous foci of living bacilli in vaccinated animals submitted to the test.

(2) *Post-mortem* examination is the only means of strictly appreciating the degree of resistance communicated to young bovines by the processes of immunization. This examination ought to be made with the minutest care. Not only the viscera but all the lymphatic glands of the organism ought to be explored. The nature of doubtful lesions will be determined by histological study and bacteriological research (on the bacilli and inoculation).

I ought to make an important remark concerning the property of the bacilli, which I extol with the title of vaccines. When one immunizes with ordinary bacilli simply attenuated, the vaccines can produce lesions in which the bacilli preserve their vitality for a long time and become a menace to the subject submitted to immunization. In these cases there is cause to note the kind of lesion and the manner in which they preserve the vaccinating bacilli (so called). This care is not necessary with my vaccinating bacilli, for their pathogenic power is profoundly modified. Not only do they not provoke tubercles in the parenchymas in the doses indicated, but if one meets them still endowed with the power of growth in the

organism their presence will be negligible, and does not constitute a menace to the subject which carries them, any more than for other animals and man himself if these bacilli come in contact with them. Consequently, the lesions which may be found at the autopsy of animals submitted to my processes of vaccination may have been present before vaccination and may not have been revealed by previous testing, which is possible. I may add that I have never given great weight to this idea in my experience, but have kept it in view.

(3) Before passing to the appreciation of results I will dwell on some notable things brought to light in the course of autopsies.

I have encountered no lesions in the lungs following intravenous injection of bovine bacilli made on animals vaccinated by the subcutaneous method, but noted a tuberculous infiltration more or less considerable of the mediastinal glands only, or of the mediastinal and bronchial glands.

Why have the bacilli cleared the lungs without installing themselves there? Have they encountered cells endorsed with a strong enveloping power which carried them rapidly beyond the lung, or would have rapidly destroyed those enmeshed in the pulmonary network? I know not. Sometimes in this connection I recall a more or less analogous fact that I have previously noted. I have observed that tuberculous bacilli injected into the jugular vein are so much the less arrested in the lung the more they are attenuated. It is beyond the lung that the weak bacilli establish themselves, for example, in the liver and spleen.

Again, following a virulent inoculation in the cervical region, I have found no lesion in the corresponding sub-scapular gland, and yet encountered recent appearance of it in the mediastinal glands. This observation presents a problem on the mode of propagation of bacilli in the organism.

Habitually when one renews the subcutaneous inoculation test on the vaccinated subjects the second inoculation produces little local trouble, and does not infect the corresponding sub-scapular gland, whilst tuberculosis more or less accentuated of this gland is about the rule from the first inoculation.

It has appeared to me impossible to procure a resistance capable of extinguishing the local subcutaneous foci following the test. But, as a general rule, this resistance is sufficient to limit the lesions of the subscapular gland. However, it is remarkable to see the results attending the second inoculation miscarry.

It is not said that virulent bacilli employed in the test of vaccinated subjects cannot arrive, and even subsist, for a greater or longer time in glands exempt from macroscopic lesions. I have encountered bacilli inoculable to the guinea-pig three and even seven months after an inoculation at the neck in the apparently free sub-scapular gland; and also in the bronchial and mediastinal glands four months after a test by the venous way.

Is there any ground for doubt and unrest as regards vaccination? No. This fact shows that the system of vaccinated subjects is not endowed with a bacteriolytic power of very high degree, but, nevertheless, has a sufficient defensive quality to hinder these bacilli from producing anatomical phenomena, which are characteristic of them when they have been inoculated. It is this defensive power that enables a vaccinated subject to retain a tuberculous abscess at the site of a subcutaneous test injection without danger to the corresponding lymphatic glands. And this power manifests itself clearly in the bulk of our experiments.

Appreciation of the Results.

No more for antituberculous than for other hitherto known vaccinations should it be contended that it confers absolute immunity, nor do all the subjects submitted to vaccination offer a uniform resistance. The immunity produced artificially is relative. One can, however, foresee that it will be more or less insufficient if the subjects are exposed to a severe infection, be it by the nature and dose of the virus or be it by the track of infection. When it becomes insufficient one will measure to some extent its value by the number and importance of the tuberculous foci, of which it has not hindered the formation.

(1) I will consider firstly the result of our autopsies in their greatest simplicity.

Among vaccinated and test animals we shall distinguish:—

(*a*) Those whose necropsy has been macroscopically negative. (*b*) Those which have presented very circumscribed lesions, caseo-calcareous either in one or a few glands. (*c*) Those on which the test has determined an extensive tuberculosis, sometimes fatal. On the first, vaccination has given complete success; on the second, a relative success; on the third, failure.

I will also divide the controls into those which the trial has granted a *complete infection*, that is to say generalized, a *partial infection* localized in some glands (mesenteric or mediastinal, bronchial and retro-pharyngeal) of one or several systems, or has not determined appreciable infection to the eye and touch.

On these bases I will obtain the following table:—

(A) Animals Immunized with Homogeneous Bovine Bacilli.

		Per cent.
Vaccinated	Complete success	50
	Relative success	25
	Failure	25
Controls	Complete infection	63·6
	Partial infection	27·2
	No infection	9·2

(B) Animals Immunized with Homogeneous Human Bacilli.

		Per cent.
Vaccinated	Complete success	42·1
	Relative success	42·1
	Failure	15·8
Controls	Complete infection	12·5
	Partial infection	87·5
	No infection	0·0

It remains to be said, first, that 50 per cent. of the vaccinated of group *A* have escaped infection as against 9·2 per cent. of the control animals, and that 25 per cent. of the vaccinated have been severely infected as against 63·6 per cent. of the controls; second, that 42·1 per cent. of group *B* have resisted infection, when not one of the trial animals has escaped infection.

If one totalizes in each table, on the one hand, the complete and relative successes, and, on the other, the complete and partial infections, and if one set the numbers obtained in this way against each other, it will be perceived that in group A vaccination has been more or less efficacious for 75 per cent. of the subjects against an infection which has infected more or less 90 per cent. of the trial animals; that in group *B* the reports have the same meaning, since the percentages are 84·2 and 100.

(2) I will consider the results now in another way. I have said previously that inoculation of the test in the control animals and the vaccinated can cause partial infection. This taken altogether should be less in the vaccinated animals, or vaccination would have failed in its aim on several subjects. It is important, then, to estimate in all cases the degree of infection.

To arrive at this estimation I will put the sign + to extended infections, and even + + to some examples of particular generalization, and the symbol + followed by one or two signs — according as partial infection seems light or very light—I afterwards add in each group (*A* and *B*) all the signs + and all the signs — and I calculate the proportion of + to — obtained by the vaccinated and trial animals.

Thus I find that in group *A* (vaccination with bovine bacilli) the

lesions are this time more important in the controls than in the vaccinated, and in group *B* (vaccination with human bacilli) twice as important as in the controls.

Relative Value of Vaccines and Methods of Vaccination.

The last line of the preceding paragraph shows that human bacilli in homogeneous cultures immunize less efficaciously than bacilli of bovine origin.

I therefore accord the preference to bovine bacilli.

From the point of view of their comparative value, I find in my experiments that the procedure by intravenous injections comes first, then follows the procedure by ingestion, and finally, subcutaneous inoculations. This classification results from the collected experiments made with each procedure, for vaccinated subjects by each process have been tested by different modes of infection; intravenous injection, subcutaneous inoculation, ingestion.

Intravenous vaccination has procured 75 per cent. of complete successes, ingestion 50 per cent., subcutaneous inoculation 10 per cent. of complete successes, and 73 per cent. of partial successes. I advise, then, intravenous injection on very young calves up to the age of 3 or 4 months, for these animals are easily restrained and need little vaccinal culture.

One may reconfer immunity towards the end of the first year, and follow from year to year by the subcutaneous process which presents the minimum of difficulties.

Vaccination by the digestive tube requires much vaccine; it is inconvenient.

The subcutaneous method will be adopted in cases where the two others would be difficult of application; but it must be repeated to obtain a satisfactory result.

Duration of Immunization.

Bovo-vaccination has been reproached with protecting animals such a short time. From my experimental vaccinations I have established the persistance of immunity seven, ten, fourteen, and twenty-two months after the first inoculation. Of none can it be said that this duration is not sufficient.

It would be preferable if the immunization was definite. But where is the artificial immunization that lasts indefinitely? Besides, one will note that immunization may, perhaps, be reinforced by periodic and absolutely harmless subcutaneous inoculations.

REFLECTIONS.

The method of immunization that I have the honour to extol in this article does not exactly resemble any of those put forward up to to-day. All the known methods depend on the employment of attenuated tubercle bacilli. Also I have reason to congratulate myself on having established first the variability of tuberculous virus and of having for a long time defended it against the partisans of the exceptional immutability of the bacillus of Koch.

From this point of view mine differs from others. But the vaccines I employ are not composed of bacilli modified individually and extemporaneously whether by heat or antiseptics, or by a passage through the organisms of cold-blooded animals. Their active agents are living bacilli of bovine origin profoundly modified in their tubercle-producing power by a long series of cultures in the depth of glycerinated bouillon. The modifications which they have taken on are henceforth fixed and of such a kind that these bacilli form races indefinitely transmissible. These races, comparable to the anti-anthrax vaccines of Pasteur, can no longer cause tuberculosis of the viscera and glands under the conditions where I recommend them to be employed. Being without danger to the monkey I consider that they are also without danger for man. By their characters our vaccines are somewhat similar to the avirulent vaccines of Professor Klimmer, of Dresden.

In all cases I am absolutely certain that they cannot cause any fatal infection in the ox contrary to the bovo-vaccine (of von Behring), and the tauruman (of Koch-Schutz) which may comprise 7 to 8 out of 1,000 subjects vaccinated.

In these conditions I shall not hesitate to use them on a large scale.

I will not say that the phase of experimental researches is closed. I hope that in persevering in the studies of the laboratory one will perfect the methods and know better the conditions which follow the checks and those which guarantee success.

But such as they are to-day it would be negligent in my opinion not to profit by the results acquired to try and restrain the ravages of bovine tuberculosis by associating vaccination with ordinary prophylactic measures as one does for other contagious maladies.

MEANS OF CONTROL OF HORSES.

By J. M. CHRISTY, M.R.C.V.S.

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I PROPOSE to deal in this paper with the means of control of horses, a subject of vital importance to every farmer.

Operations on or even local examinations of the various domesticated animals are often difficult or even impossible unless recourse be had to methods of restraint. An exceedingly numerous choice of methods is available, depending on the species of animal to be examined or on the operation to be performed.

This article will be confined to a short description of the ordinary methods which can be adopted in dealing with domesticated equines from a veterinary point of view. The control of wild, unhandled equines will not be dealt with, as that is hardly a subject for a veterinary surgeon, and, in any case, it is of too large a scope to be dealt with in an article of this kind. For this reason it is assumed, for the purposes of this article, that the animals have been handled, and are not wild or really intractable.

To begin with, the horse should be securely bridled or haltered, and held by a reliable man, who must give his whole attention to the animal, and be prepared to check at once any indication of restlessness, temper, uneasiness, or nervousness.

MANNER OF SECURING A HORSE.

The horse is the animal most frequently submitted to operation, and, owing to its strength and agility, and the readiness of its means of defence and attack, as well as its value, is perhaps the one which requires most skill, strength, and tact in securing for operation. The kind and multiplicity of means of restraint will generally depend upon the nature of the operation and the disposition or temperament of the horse.

STANDING POSITION.

The horse may be secured for operation by the head or limbs, or both.

The Head.—The head is usually secured by means of a head-collar, bridoon, bridle, or cavesson, and the auxiliary restraints are the gag, twitch, mask, blinkers or blinders, cradle, and side rod.

The employment of the first four does not demand further notice than that they should be of good material, and so attached they they will not readily slip off the head at a critical moment. When a bit is

worn in the mouth care must be taken that it does not injure the tongue or lower jaw.

A strong, active, and experienced groom should hold the horse by the head, standing in front, though a little to one side, to escape injury from the fore-feet. One hand may seize the reins or head-collar rope close to the head or under the chin; the other hand holding it near to the opposite end.

When the horse is to be secured by the head to a wall or similar resisting body, a strong leather head-collar, with one or two ropes, should be used, but a bit or rope should not be put in the mouth for fear of accident to the tongue or jaw. If the anterior part of the body is to be operated on, the head should be tied as low as possible; if the posterior, as high as convenient.

The gag is most readily formed by the rope of the halter or head-collar passed as a loop round the lower jaw, behind or in front of the canine teeth, and drawn tight. Another form of gag is made by a short piece of round wood 4 or 5 in. in diameter, with a leathern strap and buckle attached to the ends. This is placed high up across the mouth, and the strap buckled behind the ears, thus maintaining the jaws wide apart. A third form is the Polish gag, which is simply a long loop of rope placed in the mouth and behind the ears, and tightened by means of a long or short piece of stick twisted in it towards the cheek. This is a very potent mode of subjection.

The twitch is a severe instrument of control, and should not be used unless it is absolutely necessary. Generally speaking, it is far too frequently used, and is often applied to animals which would be more easily and more humanely managed by gentleness, patience, and tact. The ordinary twitch is merely a round piece of wood, from 1 to 5 ft. in length, and 1½ to 2 in. in diameter, with a hole at one end through which a piece of cord is passed and tied in a loop sufficiently large to allow the closed fist to pass through it easily. The loop is passed some distance over the upper lip, which is seized by the hand and drawn forward; the cord is then rapidly twisted by the other hand, or by an assistant, to the necessary degree, by the rotatory motion of the wooden handle. Most frequently it is applied to the upper lip, rarely to the lower, and even less frequently to the ear or lower jaw. It acts by severely compressing or squeezing the tissues, and produces such a degree of suffering as to attract the attention of the animal from the pain of the operation, and subdues it. The long twitch is held by an assistant, but for some operations, and particularly when there is not an assistant to spare, or when the horse

has to be thrown down, the short twitch is most useful. The handle of this is so short that it merely serves to twist the cord and remains without being held, or it may be attached to the cheek of the head-collar by a piece of twine or a small strap.

Blinding.—Sudden deprivation of sight often alarms the horse to such an extent that it is rendered docile, or at least more manageable, while, if it is really vicious, it cannot take advantage of a favourable opportunity to injure those around it. Sometimes, however, blindfolding does not produce tractability, but rather the reverse, and may lead to serious accidents from the horse dashing about recklessly. Any non-transparent covering will suffice to exclude vision—a handkerchief, towel, or piece of cloth tied across the face from one side of the head-stall to the other; a driving bridle with blinkers or the ordinary eye covers, known to veterinarians as "bluffs," or the mask or "blinders" will answer. The latter is the best, because, being made of leather, it acts as a guard to the eyes and eyebrows during the performance of the operation, particularly when the horse is placed in a recumbent position.

The cradle or beads allows lateral and downward movement of the head to only a very limited extent. It is composed of from eight to twelve round pieces of wood, 1¼ to 1⅓ in. in diameter, and 15 to 18 in. in length, pierced at each end by a hole, through which a cord passes. These rods are kept some inches apart from one another, either by knots on the cords or by short pieces of wood perforated from end to end, and strung on the cords between the rods. The ends of the cords are tied on the upper part of the neck, and to prevent this part being cut by them it is well to place a pad of tow or other soft material between them and the skin.

The side rod is a round wooden or iron rod from 3½ to 4 ft. in length, with a thong or small strap and buckle at each end. One end is attached to the head collar, while the other is fastened to a surcingle firmly secured round the body. It is placed on the side opposite to that on which the operation is to be performed, and prevent-bending of the neck laterally, and to some extent downwards.

In some operations on horses it is sufficient if the ears are grasped by a couple of powerful assistants and the head drawn forcibly downwards. This does not completely insure the operator's safety, but it checks attempts at rearing and striking with the front feet. This method of drawing down the head is certainly better than fastening the animal to a fixed object.

The Limbs.—It may be necessary to secure one or more limbs in

order to limit the movements of the horse as much as possible and prevent injury to the operator or attendants. One limb may be raised from the ground and maintained in a flexed position, or two or three limbs may be secured without elevation, or one may be raised and the others secured in addition. The flexed limb may be a fore or hind one, and may be maintained in that position by manual or mechanical means.

(*a*) *Fore Limb Flexed.*—The fore limb may be maintained in a flexed position manually by lifting it in the ordinary way, the assistant then standing upright and firm, his face towards the horse's hindquarters, and his hand grasping the toe of the hoof, the thumb at the toe of the shoe, and the fingers extending on the front of the wall, holding the limb well flexed, the foot towards the elbow. If it is a left fore limb, then it is held by the assistant's left hand, and *vice versa*. Strength, agility, and tact are necessary in manipulating the limbs, and in holding up a fore leg the assistant has often need of these qualities, and to a high degree. Attempts should not be made to prevent all motion in the flexed limb, and the hand should follow its swinging movements forwards and backwards, care being always observed in keeping the balance should the horse bound forwards.

To prevent injury and fatigue, or when an assistant is not available for this purpose, the mechanical method can be adopted. In this a rope or strap is employed to attach the pastern to the forearm. The leg is well flexed at the knee, and the rope or strap is then passed round the forearm and pastern, a complete turn being made, if necessary, for greater security, around the pastern. A leather strap with buckle is to be preferred, as it is easier applied and removed, and not so likely to injure the limb. To prevent contusion by the hoof, it may be necessary to interpose some soft substance between it and the elbow.

Another mechanical method is by the side-line. This is a long cord, or rather thin rope, or, better still, strong web band, about 20 ft. in length, with a loop or hobble strap at one end. The loop or strap is placed round the pastern of the limb to be raised, and the rope or band is passed over the horse's shoulder to the opposite side, where it is held by an assistant after the leg has been flexed, or it is passed in front of the chest, round again to the same pastern, where it is fixed, the weight and strain being thus thrown on the withers.

(*b*) *Hind Limb Flexed.*—The hind limb, like the fore one, may be flexed and maintained in that position manually or mechanically.

Manual flexion of the hind limb is more difficult and dangerous than that of the fore limb, owing to the powerful action of its flexor and extensor muscles and its wider range of movement. A strong farrier is the best assistant in maintaining this limb raised in a flexed position. The horse's leg (or shank) rests on the assistant's thigh, his limb corresponding to that of the horse—*i.e.*, right leg to right leg, and *vice versa*, his back being towards the horse's head. As with the fore limb, the assistant should stand as erect as possible, and not allow himself to be drawn beneath the horse or thrown down. The strain is much relieved, should the limb have to be held up for a considerable time, if he wears a cross or shoulder belt with a strap attached, which he passes round the pastern, holding the end firmly in one of his hands; or, if the horse's tail is very long, it may be passed round the pastern and held in the same way.

Mechanical flexion of the hind limb—that which is preferable, and in many instances is alone practicable—can be achieved in several ways. The first and simplest method, if the horse has a long tail, is to bend up the hairs into a large loop, pass a piece of rope half round this loop, and both ends through it, pulling them tight so as to close the loop. One end of the rope close to the tail has a loop or an iron ring spliced in it; the other end, being the longest, is passed completely round the pastern, the limb being raised and flexed backwards, or through the ring of the hobble if one be worn; then it is tied to the loop or ring at the short end of the rope. By this means the raised hind limb is secured as high as may be necessary to the tail, which bears the strain. It may be observed here that, unless a hind hobble-strap is used for the pastern, it is well to have a piece of flannel or cloth wrapped round it to prevent the skin from being contused or abraded—sometimes a rather troublesome accident when a sharp rope is employed.

The hind leg may be kept raised either forward or backward by means of a rope or the side-line already described. This can be employed in various ways:—

(1) Secured to the pastern by one end, the other end is passed through a body surcingle, and, being pulled by one or more assistants, the leg is drawn forwards and upwards; the rope is then tied to the surcingle or carried back through it and held there.

(2) After securing one end of the rope or side-line to the pastern, the other end is carried between the fore-legs, across the chest, and back behind the shoulder of the limb on the opposite side, over the back, and down towards the elbow on the same side as the limb to

be secured, where it is passed over the portion beneath the chest, and brought out again. By this mode the horse's back bears the strain.

(3) One end of the rope or side-line is tied round the base of the neck by a fixed knot; the rope is then passed backwards, outside the shoulder, to the pastern of the hind leg which is to be raised; if this has on a hobble strap, the rope is passed through the ring; if there is no strap, then the rope is carried inside the pastern, around it, and forward outside. Traction being now made, the leg may be lifted to the required height forward, and a turn of the free portion of the rope around the fixed part will fix it, one assistant being sufficient to control the movement of the limb. It may be noted that when it is at any time necessary to make a fixed knot in a rope which it is desirable should be readily untied, a small lock of hay or straw tied in the knot will facilitate this object; the straw being pulled out leaves the knot loosened.

(4) To flex the limb backwards, the rope or side-line is fastened round the neck and carried to and around the pastern in the manner just described. But instead of bringing it forward again, after the leg has been raised sufficiently high, one or two assistants pull the line backwards, and maintain the foot there. Another assistant, if the operation be on this foot, or even elsewhere, holds up the leg, thus steadying it, and supporting the horse at the same time.

(5) In order to throw the strain over a wider surface and limit the movements of the limb more effectually, the line is fastened round the neck, as in the two preceding methods, but, instead of passing downwards and backwards, the knot lies on the withers, the line directed along the back until it reaches the root of the tail; around this part it is passed, then brought down to the pastern of the leg to be raised. If a hobble-strap is worn, the ring side is turned to the rear, and the line passed through the ring, when, one or two assistants pulling, the foot may be sufficiently raised; passing the free portion once or twice round the fixed part secures it. If a hobble strap is not employed, then the limb should be raised, the line passed round the pastern, and held as described.

To prevent rearing and kicking during the performance of operations, the limbs are sometimes shackled by ropes or hobbles so that they cannot be raised to any distance independently. To prevent kicking, a hobble or shackle may be placed on each hind pastern, and a rope (the rope and chain of the ordinary hobbles do very well) is attached to both, but so as to leave a space between the hind feet. The rope is then passed between the fore legs, over the shoulder,

across the back, and round the fixed portion of the line, as in the second method.

The hind legs may be restrained and the fore ones limited in their movements by another method. This consists in using two side-lines, one for each. These are attached to the hind pasterns, passed between the fore legs, round the forearms, and underneath and within the fixed portion, and are tied over the back immediately behind the shoulders. The lines may be crossed in such a manner that the one on the left pastern goes to the right forearm and that on the right to the left forearm.

Another method is adopted by Legoff. The apparatus is very simple, and consists of a hempen rope the usual thickness of the side-line rope, the total length of which is that between the hind and fore limbs of a large-sized horse. It is single at one end and double at the other—Y shaped—each of the three extremities being provided with a running noose or loop. If it is desired to operate on the posterior part of the body, the loops of the double end are placed one on each hind pastern, the loop of the single end on the pastern of one of the fore limbs. If the anterior part of the body is to be operated on, then the double loop end is placed on the front pasterns, and the single one on a hind pastern. If the rope is too long for a small-sized horse, then the bifurcated portions may be twisted round each other as many times as may be necessary to make it sufficiently short.

For dangerous horses a very useful apparatus is the hippo lasso. It may either prepare the way for using hobbles or may even supersede them altogether. It consists of a front and hind portion hung by broad straps which pass across the back just behind the forearm and in front of the stifle-joint respectively, and held together by two other straps fastened to the front and running through rings in the back portion. By pulling on these straps the animal's fore and hind limbs are drawn together, and is effectually prevented from kicking either with the fore or hind legs. Many horses when thus secured lie down without struggling.

Recumbent Position.

For the carrying out of important surgical operations, horses are usually thrown down and secured. There are various ways of throwing the horse. I shall describe three of them.

(1) The side-line method. Special throwing harness is made for this purpose; lacking these, one may use a piece of ¾-in. rope, 40 ft. long, doubled at the centre, and tied to make a loop at that point about

2 ft. long. This loop can be slipped over the horse's head in the form of a collar, the knot coming at the top of the neck. The ropes are then brought down one on either side of the horse, each passed under the fetlock joint of a hind leg, and the end run forward through the collar. Assistants, by taking hold of these ropes while the horse is backed, can draw his legs well forward and up on his sides. When the horse is down the feet can be tied in this position with the rope.

(2) The hobble method consists in putting a strap or hobble around each leg just below the fetlock joint. A rope or a chain is then passed through a ring in each hobble, and all four feet are drawn together in a bunch, causing the horse to lose his balance and fall This method should be used on all horses over nine or ten years of age, as by the use of side lines they are likely to injure their heads by struggling. The side-line method is excellent for throwing young horses, especially for castrating, as the hind legs are drawn well forward and out of the way.

(3) A third method of throwing the horse consists in taking up one fore leg, usually the right, or "off" one, by a strap, which is passed either over the animal's back or under his belly, and held by the operator, who stands by the left ("nigh") foreshoulder. The operator holds up the foot with the right hand, at the same time drawing the horse's head around toward the left and pushing against its left shoulder. This throws the horse on his right side. At once the operator should get on the side of his neck, close to the horse's head. This keeps him down, for horses get up on their fore legs first, and it is necessary for them to throw their heads upward in order to get their balance.

In throwing horses, a spot of level greensward should be selected, or the floor or ground be well covered with straw to avoid injury as the animal goes down. It is a good plan to place a folded blanket under the horse's head to prevent injury to him while down. In working about horses an operator is liable to be hurt either by the animal's kicking, biting, or striking with the fore foot. The safest place by a horse when he is standing is close to the left shoulder, as the horse is unable to kick or strike a person there, and the head can be kept away by holding with the right hand. A person should stay close to a horse, or else keep quite out of his reach. A medium distance is dangerous ground.—*Transvaal Agricultural Journal.*

RESOLUTIONS OF THE NINTH INTERNATIONAL VETERINARY CONGRESS AT THE HAGUE, SEPTEMBER 13-19, 1909.

A. GENERAL MEETINGS.

Government efforts against swine plague and hog cholera (swine fever) based upon the recent researches regarding their etiology, vaccination, serovaccination, &c.

(1) Hog cholera and swine plague are in reality two different diseases, and as they are also different in regard to their infectivity, they must be dealt with differently from the point of view of veterinary police.

(2) Hog cholera, which is caused by a filtrable virus, is a dangerous contagious disease, without considering the nature of the secondary infections, and it must be combated everywhere in uniform methods and with all possible means, on account of the great economical losses it gives rise to.

In regions where the disease is not common, and where it occurs only occasionally from time to time, compulsory killing of all infected animals, and of those which are suspected, is recommendable. Suitable compensation should be given to the owners.

In heavily-infected districts, where there are large numbers of swine, the disease must be repressed by a most severe application of the usual measures of sanitary police, employed against contagious diseases of animals.

In this struggle preventive inoculation with the blood-serum of hyperimmunized hogs, applied to herds which are already infected, may be regarded as a measure that can considerably reduce the mortality. Mediately it gives rise to an active immunity. This method has rendered important services; moreover, the result of recent researches leads to the hope that active immunization of non-infected herds may prove a powerful method of prevention. Therefore the study of preventive inoculation deserves to be strongly promoted by governments.

(3) To prevent and repress swine plague, which is usually spread by sick animals, less rigorous measures than those employed against swine fever will be sufficient.

(4) To prevent swine fever and swine plague by measures of sanitary police, the first conditions are that the herds of sick swine are detected by the compulsory report of disease, and that control of trade movement of swine be introduced. An important help would be

given to these measures by the introduction of the obligatory inspection of meat, and a regulation that all dead pigs should be brought to flaying-houses for examination before being disposed of.

(5) In addition to police measures, owners should be induced, by proper instruction, to take measures on their own account to prevent the introduction of hog cholera and swine plague, and to do all they can to conquer those diseases.

These measures are:—

Quarantining of newly purchased animals before they are brought into contact with other swine, hygienic treatment of swine, killing of diseased animals, regular disinfection of the stables, and, especially with regard to hog cholera, preventive inoculation.

The protection of the practice of veterinary medicine.

The laws and provisions existing at the present time are not everywhere sufficient to protect the practice of veterinary medicine; in order to obtain effectual protection in those countries where it has not yet been realized, special legal provisions should certainly be made.

The rôle of the veterinary surgeon as expert in zootechnical questions.

The Congress sees in the appointment of veterinary surgeons as official experts in zootechnical matters a powerful factor for the advancement of the breeding of domesticated animals. The Congress strongly recommends governments to entrust matters concerning the breeding and rearing of domesticated animals to veterinary surgeons.

The conditions necessary to obtain the doctorate in veterinary science.

(1) The Congress considers indispensable for the complete academic development of the veterinary studies that the degree of doctor of veterinary medicine should be made accessible to veterinary surgeons.

(2) Only independent superior veterinary schools and veterinary faculties having all the rights of faculties existing in universities or superior schools, organized in various departments, ought to be recognized as being competent to confer the degree of doctor.

(3) The conditions under which the degree can be conferred ought to be analogous to those demanded for the doctorate of other scientific departments.

(4) It is desirable that the obtention of the degree of doctor should be made also accessible for veterinary surgeons who have obtained their diploma previous to the establishment of university studies for veterinary medicine.

(5) The Congress brings a vote of thanks to Austria and to Hungary for having created the possibility of obtaining the degree of doctor of veterinary science at the superior veterinary schools.

The sanitary control of milk and the obligatory systematic inspection of meat.

(a) Meat Inspection.

(1) With reference to the conclusions, proposed by the Obermedizinalrat Professor Dr. Edelmann, Dresden, in correspondence with the conclusions proposed by the other reporters, and passed in the sense of the discussions, the Congress insists once more on the high signification of obligatory meat inspection for public health and sanitary police.

(2) The Permanent Committee of the International Veterinary Congresses is requested to inform the Governments of such States as have not yet introduced obligatory inspection of meat of the resolution of the Congress.

CONCLUSIONS OF MR. EDELMANN AND OF THE OTHER REPORTERS.

(1) The principal object of the obligatory inspection of meat instituted by the State is to protect human health from the dangers threatening by the use of meat.

(2) This inspection must extend in the first place to the animals usually killed for consumption in the country, except rabbits and fowls.

Whether fresh or prepared, the meat imported into a country must also be inspected.

(3) Only veterinary surgeons are designated by their technical knowledge to have charge of the inspection of meat and of the control of meat products.

Inspection by other persons than veterinary surgeons (laymen, empirics) ought not to be allowed, or only by reducing their use as much as possible, and whenever the services of a veterinary surgeon would involve complications or expenses beyond the object in view.

(4) It is in the interest of the inspection to be what it should and could be, to give the technical inspectors a proper social position, with corresponding remuneration.

(5) The practice of obligatory inspection of meat in the name of the State means examination of the animals before and after slaughtering (inspection of the animals and of the meat).

The exemption for animals killed for private use is not without presenting some dangers from the hygienic point of view. If, how-

ever, this exemption is accorded, it must never be for animals killed on account of their being sick.

(6) Inspection ought not to be abandoned in relation to trichinosis, where its presence in pigs, boars, and dogs, and the fact that all the trichinæ contained in the meat are not rendered harmless with certainty by the preparation that this meat undergoes in order to serve for human consumption, is to be taken into consideration.

(7) For the inspection to be complete and deserving as much confidence as possible, resorting to any method that has proved to be good cannot be neglected; especially for the discovery of harmful micro-organisms bacteriological examination is indispensable.

(8) In establishing the principles upon which inspection of meat shall be regulated, it is necessary to take always into consideration the positive results obtained by scientific researches, and, in case there is no objection with regard to sanitary reasons, to apply them as liberally as possible.

(9) The division of meat into good, conditionally good, inferior, and bad meat is practically to be applied.

Whether it is necessary to make the distinction of inferior meat depends upon what is required by the consumers.

(10) Bad meat must be disposed of in such a manner that in no way the germs of disease can be propagated.

(11) The utilization of conditionally good meat and, if necessary, of inferior meat, ought to take place only in the town of slaughtering or in a region as small as possible, and under police control.

(12) Obligatory inspection of meat in a State ought to be placed under a central direction. Experience has demonstrated the necessity of an efficacious control of the inspectors, especially of those who are not veterinary surgeons.

(13) Regular statistics, made up by the inspectors by daily annotations, are economically and scientifically of great value.

(14) It is recommendable to extend the examination to other animal food, especially game, fowls, fish, crustaceous animals, and molluscs.

(15) It will be good to complete the official obligatory inspection of meat by a control, made by veterinary surgeons and police officers, of the trade in meat in markets as well as in slaughter-houses and manufactories of meat products.

(16) One cannot insist too much on the great importance of official abattoirs with regard to general hygiene and the examination of meat. In larger towns municipal abattoirs should be erected. For smaller towns the erection of joint abattoirs is to be recommended.

Veterinary surgeons have proved themselves excellent directors of official abattoirs.

(17) In so far as the hygiene of meat is no special branch of examination for veterinary surgeons, it should be introduced.

To be admitted to the governmental examination (for veterinary surgeon) a certificate of having had an abattoir practice of at least a few months, for being appointed director of an abattoir one of having had a practice of at least one year, is required.

(18) It is desirable that the teaching relating to the hygiene of meat should be made more thorough in veterinary superior schools, and at the same time it would be necessary that veterinary students should have more opportunities of becoming familiarized with the technique and construction of abattoirs.

(b) Control of Milk.

(1) The regulation of the control of milk and milk transport is urgently required.

(2) The control must consist in :—

- (*a*) A control of the stables (examination of the state of health of the animals, of the food and treatment of the milk cows), and
- (*b*) A market control (examination of the milk brought to market).

(3) The stable control and the sanitary market control (examination with regard to alteration of milk, to sale of colostrum milk, to pathogenic milk germs, &c.) belong, of course, to the task of the veterinary surgeon.

(4) Stating adulteration by the addition of water, the removal of cream, and the presence of substances for conserving the milk, must be left to an expert with chemical training.

(5) Milk that is offered for sale as milk of superior quality should answer to special requirements.

The methods employed in treating the carcases and meat with the object of rendering them harmless.

(1) Flaying houses should be regulated by law and placed under governmental control, with compulsory confiscation of the dead and other animals that must be rendered harmless. Certain standard should be introduced with regard to the smallest size of the animals.

(2) The harmless destruction of carcases and confiscated meat may only be done by combustion or in special apparatuses heated by steam.

(3) For large abattoirs and flaying-houses with apparatuses for destroying carcases a system is to be chosen that with a minimum of expenses and simple manipulation assures complete sterilization of the carcases in such a way that the matter introduced leaves the apparatus in a finished state as a final product, and that the obtaining of valuable products is secured.

The prophylaxis and pathology of protozoan diseases.

(1) The Congress votes once more the resolutions formulated at the Congress at Budapest, and impresses upon the governments which have not yet organized a veterinary service the necessity of doing so with as little delay as possible.

(2) It is necessary for the struggle against contagious diseases in the Colonies that all governments concerned should materially encourage the study of the tropical ones. Since the etiology of a disease forms the basis of all sanitary measures, it is desirable that, as soon as possible, veterinary investigators should be sent into territories where diseases which have not yet been investigated are prevalent for the purpose of making a study of them.

The results of these investigations being of a common interest, both from the scientific point of view as well as from that of State veterinary medicine, they should be communicated to all governments concerned.

(3) For the purpose of carrying out the above proposals there should be established an international bureau of tropical diseases of animals, consisting of veterinary representatives from all the countries concerned. This bureau, amongst other things, should publish a bulletin giving the results of all recent researches dealing with tropical diseases of animals.

The governmental control of sera and bacterial products and their preparation by government.

The Congress esteems the governmental control of the sera and bacterial products necessary in those countries where the preparation of the same is not undertaken by the State.

Avian tuberculosis in its relations to tuberculosis in mammalia.

The avian tubercle bacillus being, in some cases, capable of infecting mammalia, it stands to reason that, with regard to avian tuberculosis, the same preventive measures should be applied as are taken against tuberculous meat.

The sterility of cows and its dependence upon the infectious diseases of the genital organs.

(1) With the view of determining more exactly the causes and results of contagious vaginitis a system of collecting statistics in the different countries ought to be established.

(2) In order to advance the study of the pathology and the treatment of diseases of the genital organs of the female domesticated animals, and, by doing so, to contribute to the national wealth, to the improvement of science, and to the well-deserved position of the veterinary surgeons, it is necessary to introduce into the curriculum of the veterinary schools a course dealing with the examination of the genital organs of bovines.

(3) It is also of urgent importance to establish research stations for the purpose of determining by clinical and experimental observation the influence of diseases of the genital organs on the fecundity of bovine animals.

Governmental efforts against tuberculosis, with regard to the ways of infection in this disease.

(1) Effectually to prevent the further spread of bovine tuberculosis and to conquor the disease, gradually but certainly, governmental measures are wanted.

(2) The governmental measures must extend to all open forms of this disease, and in the first place to open tuberculosis of the lungs and to tuberculosis of the udder; secondly, to tuberculosis of the uterus, the bowels, and the kidneys.

(3) For the forms of tuberculosis mentioned under (2) compulsory notifying report must be introduced.

(4) Animals suffering from open tuberculosis are to be killed immediately; the owners must be indemnified. The stables of these animals and their immediate surroundings must be disinfected.

(5) To prevent tuberculosis being spread by the milk residues of the dairy farms, sufficient sterilization of the skimmed milk, buttermilk, and whey, before they are used as food for animals, must be recommended, and also the destruction of the centrifuge rests.

(6) Besides the governmental measures against open tuberculosis of cattle, extensive voluntary measures to repress tuberculosis, protected by Government, ought to be recommended to the owners, and their general application encouraged with the help of the State.

(7) To secure a uniform execution of governmental measures against tuberculosis and to promote essential private measures a

central institute for the struggle against tuberculosis should be established in all countries.

(8) The obtaining of tuberculin for veterinary purposes is to be controlled by the State. In every case tuberculin should only be given to medical men and veterinary surgeons.

(9) The next Congress should treat measures to be taken against breeding cattle reacting on tuberculin, from the point of view of international traffic.

(10) The Congress invites the Permanent Committee of the International Veterinary Congresses to study the opportunity of an international committee for combating the tuberculosis of cattle, and, if possible, to formulate a proposal for the next Congress.

B. MEETINGS OF THE SECTIONS.

First Section: Public Veterinary Medicine; Control of Food.

Inspection of fish, game, poultry, crustaceous animals and molluscs, and of other animal foods, not included at the general meetings, in relation to the hygiene of man.

I.

(1) The control must comprehend all animal foods.

(2) Endeavours should be made that in all countries the laws concerning foods should contain provisions to the effect that all controllers are to have an unrestricted right of officially acting likewise in those places where victuals are manufactured.

(3) It is desirable that not only in towns, but, if possible, also in the country, regular control of food be introduced in order to give the greatest possible number of inhabitants the requisite protection of sanitary and material interests.

(4) The best means of solving this question would be the association of smaller communities to districts, each of which should build its own abattoir and entrust the veterinary surgeon of this abattoir with the control of all the vituals of the district.

(5) Where this should prove unpractical, governments should try to induce the communities to apply to the nearest veterinary surgeon —for preference the surgeon of an abattoir—to undertake the functions of controller of foods.

(6) To obtain the necessary veterinary surgeons also in small communities, it is recommended to support the erection of abattoirs exploited by societies, but under veterinary direction.

23

II.

The Congress, considering that an inspection of the banks of oysters and other alimentary molluscs is neither possible nor useful, expresses the desire that all places where molluscs are consumed be placed under the control of the hygienic offices and provided with basins of purification for storing the molluscs before they are brought to market.

III.

(1) On account of the diseases which have been the result to men from the use of game, fowls, fish, molluscs, crustaceous animals, and other animal products, it is necessary that an official control should vouch for their wholesome condition.

It is possible to carry out the sanitary inspection of these products without seriously prejudicing trade.

On account of the special knowledge that is required from the experts charged with these examinations, the control of these products cannot be realized in a scientific manner except by veterinary surgeons.

(2) The laws and regulations relating to the inspection of meat must provide for the control of game, fowls, fish, molluscs, crustaceous animals, and other animal products, and mention the various alterations which require total or partial confiscation or sterilization.

Animal products imported from foreign countries ought to be submitted to inspection by frontier veterinary surgeons at the moment of their introduction.

It is necessary that abattoirs for rabbits and killing-places for game, fowls, fish, molluscs, and crustaceous animals, as well as the factories of conserves proceeding from these animals, should be submitted to regular inspection.

(3) The introduction of animal products into cities ought to be regulated in such a way that they be directed, as soon as possible after their arrival, towards a centre of veterinary inspection having a bacteriological laboratory. It is indispensible that in large cities several veterinary surgeons be specially appointed for this control. This first inspection is to be completed by visits of inspection to the markets and to the shops of dealers.

IV.

(1) On behalf of the veterinary control of the fish market, it is to be recommended that the courses about the knowledge of fish,

hitherto held separately, be united to one by creating a lectureship on the knowledge of fish at the veterinary schools.

(2) At all veterinary superior schools lectureships should be created for the encyclopædia of the knowledge of fish, where the principles of anatomy, physiology, systematic pathology, and fish culture is to be taught in a compressed form.

(3) The subject should likewise be added to the programme of examination.

Insurance of stock in relation to obligatory meat inspection.

(1) It is desirable that in all countries insurance should be introduced, both in the interest of the meat inspection, the execution of which being thereby much facilitated, and in that of the farmers and butchers.

(2) In so far as the insurance of cattle is not undertaken by the authorities, these should, by distributing model statutes, induce the communities, agricultural corporations, as well as societies of butchers and cattle merchants, to constitute companies for the insurance of cattle, founded on the basis of reciprocity.

Disinfection of the vehicles of transport and animal products in international traffic.

(1) The transport of cattle and animal products which can cause danger of infection ought only to take place (by rail) in vans which have been especially appointed for that purpose and can be easily distinguished from other vans.

(2) After each transport of cattle or the above-mentioned animal products, the means of conveyance must be disinfected, and the most convenient places for doing so are, in the case of railways, the central points, and for ships the unloading places.

(3) The regular destruction of excrements, collected when loading or unloading, must be assured; the best means of destruction is by combustion.

(4) The disinfection of loading and unloading places and of the different objects used for doing so, must be strictly attended to; the ground must be arranged in such a way that this disinfection is practically possible.

(5) After loading and unloading cattle, vans must be provided with a mark which, after the disinfection, will be replaced by another to indicate that the carriage may again be used for transport; the construction must be such that disinfection, if desired, can be accomplished by means of gaseous disinfectants.

(6) After unloading cattle vans must be sealed if the disinfection is not performed at the place of debarkation.

(7) All the above-mentioned formalities must be done under the direct supervision of Government veterinary surgeons.

(8) It is desirable that various countries between which an important and extensive traffic is carried on—countries like Russia and Spain, with special rail-guages, excepted—make contracts which will guarantee that the measures indicated by the above-mentioned resolutions are carried into execution.

(9) An International Commission shall be charged to define the best method of disinfection of wagons and to examine the best method of disinfecting the animal products before their forwarding, or before their unloading for the national traffic.

Serotherapy, seroprophylaxis, and vaccination of foot-and-mouth disease, and their value from the point of legal sanitary police.

(1) It is possible to prepare an active serum against foot-and-mouth disease.

(2) Its use, in combination with other sanitary measures, can become an efficacious means for the combating of the disease.

(3) The preparation of an active serum is to be assured by State institutes which guarantee against the spread of the disease.

SECOND SECTION: PATHOLOGY AND BACTERIOLOGY.

The diagnosis of infectious diseases by means of the recently-discovered reactions of immunity (except the subcutaneous injection of tuberculin and mallein).

(1) Reactions of immunity have a great value for the diagnosis of infectious diseases.

(2) A continuation of the comparative study of the various reactions is recommendable in order to assure more completely its practical application.

Vaccination against tuberculosis.

(1) At the present time there is no vaccination which in itself is sufficient to combat in an efficient manner bovine tuberculosis in heavily-infected herds.

(2) In how far it is possible to bring about a more successful issue of the difficult struggle against bovine tuberculosis by a combination of vaccination with prophylactic and hygienic measures must be demonstrated by new practical experiments.

(3) The Congress urgently requests the governments to grant also

in future the means for extensive experiments to examine the methods of vaccination against bovine tuberculosis under the different conditions of agricultural practice.

Anatomo- and histo-pathological diagnosis of rabies.

(1) Autopsy may often reveal alterations which point in all probability towards rabies.

(2) The detection of Negri bodies is to-day the most accurate method of diagnosing rabies, animal inoculations excepted. If such bodies, with characteristic structure, are found within unaltered or almost normal ganglion cells, the diagnosis of rabies is justified.

(3) In case Negri bodies are not found, or conditions make it impossible to look for them, the diagnosis of rabies may be made with much probability by finding the lesions in the cerebro-spinal ganglia, described by Van Gehuchen and Nélis, or the rabious nodules and the infiltrations about the walls of the blood-vessels of the medulla oblongata found by Babes.

(4) If the histological examination leaves any doubt as to the diagnosis of rabies inoculations must be made.

THIRD SECTION: PRACTICAL VETERINARY MEDICINE.

Infectious pleuro-pneumonia of horses.

(1) Infectious pleuro-pneumonia of the horse is a contagious disease confined to the horse, which should be clearly distinguished from other similar diseases, especially from typhoïd fever. It is characterized by an acute, infectious, fibrinous inflammation of the lung and the pleura, with alterations in other organs.

(2) The etiology of infectious pleuro-pneumonia of the horse and other similar diseases is not yet cleared, and, as the researches on the subject demand great expenses, it is necessary that the governments of those countries in which the disease is prevalent should encourage and financially assist them.

(3) It is desirable that infectious pleuro-pneumonia in the horse should be combated with official measures of sanitary police.

Chronic deforming arthritis of horses.

(1) Prophylaxis of chronic deforming arthritis of horses must occupy itself with the species:—

(*a*) By removing from the breeding studs all such animals as are predisposed on account of their constitution;

(*b*) By giving methodical and systematical detailed reports

about the state of health, the individual peculiarities, and those of the family of the brood animals;

(*c*) By trusting only veterinary zootechnical specialists with the operations in the breeding establishments.

(2) This prophylaxis must convince the societies of horse-sport and the administration of studs that it is necessary:—

(*a*) To arrest the progress of the intensive exploitation by retarding the work of brood stock in such a way that they are never set to work before their second year is completed;

(*b*) By giving only slight exercise to colts of both sexes, and to reserve the heavier work for stallions and mares till they are three years old, whilst at the age of two years they have only taken part in slight training exercises;

(*c*) By introducing in general fundamental trials of resistance under an average weight in preference to those of excessive rapidity under a small weight.

FOURTH SECTION: ZOOTECHNY AND VETERINARY HYGIENE.

Physiology of milk secretion; relation between the external form of cows and the production of milk.

It is to be recommended that the researches by veterinary surgeons concerning the relations existing between the external form of cows and milk production, or, better still, the relations between the external form, the health and the milk production, be continued.

It is desirable that the unity in the methods of examination and in the interpretation of the results be augmented.

It is desirable that a report expressing practical wishes in this regard be prepared for the zootechnical section of the next Congress.

Teaching of zootechny.

(1) It is necessary that at veterinary schools extensive lectures on zootechny be given.

(2) Very serious examinations should be held on this point.

(3) The next Congress will treat in one of its sections the following questions:—

What is the influence of heredity in the early development of affections which stunt the economical usefulness of horses? What are the manifestations of this heredity that should be avoided in regard to breeding animals?

Clinical Articles.

A CASE OF VALVULAR DISEASE WITH DILATATION.

By MAJOR W. R. WALKER, A.V.C.
St. John's Wood Barracks.

The subject was a black gelding, aged 8, belonging to "B B" Battery, R.H.A. This horse had always performed its work well, and had never before been on the sick list. On the morning of May 25 it was noticed to be lying down, apparently quite comfortable, but when it was time for it to join the other horses at morning exercise it was found to be unable to rise without assistance. It was taken with difficulty to a loose box, and fell on the way. When it reached the box it lay down immediately. The pulse was almost imperceptible, and respiration difficult; temperature 101° F.; mucous membrane dark in colour. After laying quietly for about an hour, it struggled slightly and died.

The *post-mortem* appearances were as follows: The heart was hypertrophied with excessive dilatation, especially on the right side; the right auricle was twice the normal size, and its walls flabby and very easily torn or pierced by the finger; both the tricuspid and bicuspid valves were much thickened and puckered. This condition was most marked in the tricuspid valves. The ventricles contained clotted blood. The heart, when washed and cleaned, weighed 10 lb. From its appearance I expected it to weigh heavier, but the dilatation was more marked than the hypertrophy.

The lungs contained dark-coloured blood, which changed to a bright colour on exposure to the air, otherwise healthy. Other organs healthy.

BOTRYOMYCOSIS FOLLOWING CASTRATION IN THE PIG.

By B. FRACARO.

Five pigs, two males and three females, castrated at the age of 2 months, presented a tumefaction at the level of the operation wounds twenty days after operation. In the hogs there was an endoscrotal tumour, the size of one's fist, hot and painful, which one could follow by palpation up to the inguinal ring. In the "mins" (or females) the tumefaction situated at the level of the left flank was less pronounced, but it extended towards the bottom of the abdomen, or seemed to be continued across the wall of the flank into the

abdominal cavity. In all the pigs the wound was fistulous, and gave discharge to some granular fœtid pus. The tumours were removed surgically; examination of them showed that they were botryomycotic in nature.

(*La Clinica Veterinaria.*)

COMPOUND FRACTURE OF THE NASAL BONE IN A HORSE.[1]

By PROFESSOR W. C. SCHIMMELL.

A MARE, aged 3, ran against a wall and was badly wounded about the head.

On examination there was a V-shaped wound on the nasal ridge; the lap of skin forming the edges of the wound hung down so that a triangular surface of the roof of the nose was laid bare. The nasal bones were fractured and depressed from the median line inwards. The impression extended below to the base of the wound, where the skin was separated from the bony wall and a pocket-shaped cavity had arisen. On movement the horse showed dyspnœa.

After removal of a splinter of bone, reposition of the pieces of bone was effected, the fold of the skin turned up, and the edges of the wound united by button sutures.

After the operation the horse was turned round in the stall and put in pillar reins.

The wound was syringed out daily with 1 per cent. sublimate solution. On the third day the discharge from the nasal openings and skin wound was not purulent, but on the following day it was. For better removal of pus two of the sutures on the left side were removed and exercise for half an hour daily ordered. The temperature was 38·6° C. On the eighth day it was 39° C., and the horse was turned out to pasture near the clinic. There, after the twelfth day, the discharge gradually declined and the temperature sank to normal. A strip of dead skin at the edges of the wound, about the breadth of one's finger, was removed after the sutures had been taken out. After nineteen days' treatment healing had so far advanced that the horse could be discharged.

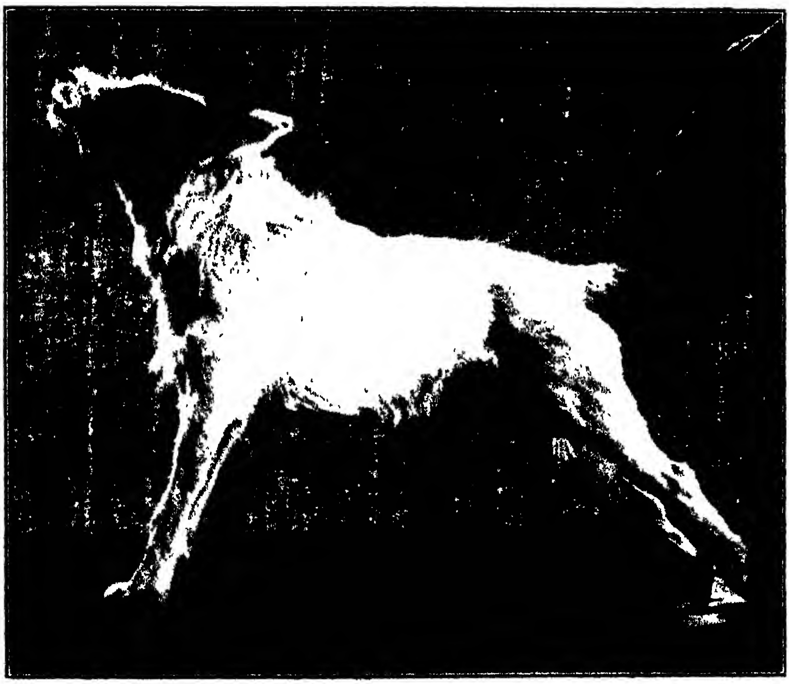
[1] From the Reports of the Surgical Clinique of the Imperial Veterinary School at Utrecht.

Canine Clinical Notes.

TETANUS IN THE DOG.

By J. STEWART WOOD, M.R.C.V.S.
Parkstone.

Well-marked cases of tetanus in the dog are in my experience extremely rare, but probably many cases of stiffness in muscles and joints that are attributed to rheumatism or chill are in reality due to tetanus, although the symptoms are not acute enough to establish that diagnosis.



Tetanus in the Dog.

In the case recorded the symptoms were so distinctive as to leave no room for doubt. The patient, a male fox terrier, about eight years old, was brought to me on May 2 for the purpose of having a dog tick (*Ixodes ricinus*) removed from his back; it was situated above the spine just behind the shoulder blades. This was done after saturation with spirits of turpentine, and I suggest that the small wound made by the attachment of the tick was the seat of the inoculation, the dog being noticed to roll in the garden on his return. I was next asked

to see the dog on May 14. I was told that he had been gradually getting stiff for some days. I found him showing undoubted signs of tetanus; he was very stiff and could only just walk, frequently tumbling over. The head was elevated, the spine depressed, the legs stretched out, the position being typical of that known as *Opisthotonos.* The animal could lap milk, but with difficulty; the temperature was slightly subnormal, 99° F.; and the breathing was shallow, but regular.

The next day the conditions were aggravated, with the exception of power to turn the neck slightly. The dog was as if carved out of stone—when stood up he remained standing, if carefully balanced, when recumbent he remained immovable—like a toy dog that had been knocked over. There was no excitement apparent; he was too stiff to show it if present. When stimulated by a noise or touch, the left hind leg moved a little, and that was all. Trismus was now completely established.

As an experiment, I put the dog under chloroform: he took it quietly. Under its influence the tenseness of the muscles gradually relaxed—the anterior part of the body first, the posterior some minute and a half later. When thoroughly under the chloroform the dog became quite limp. I took the opportunity of passing the catheter, emptying the bowels, and feeding him through a tube. He was then well massaged. After removing the chloroform the dog gradually became stiff again.

He died quietly on the morning of the 16th. The photograph was taken soon after death, and shows his position very well.

I would draw attention to the fact that trismus was the last condition to be established. In another case in the dog that I have seen the position was that known as *Tetanus lateralis.* The dog could eat freely, although his body was bent as a bow.

SARCOMA OF THE FEMUR IN A MASTIFF.

By GEORGE H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.

Professor in the Royal Veterinary College, London.

THE subject of this note was a large male brindle mastiff, aged 7. For the last four years he had been in the possession of Mr. W.

He was first brought to the College clinique on October 13, 1909, suffering from acute lameness of one hind limb. The only history of any previous illness was that in 1907 he was often disinclined to walk

any distance, and was constantly lying down. He recovered from this apparently debilitated condition, with occasional short relapses, but there was no indication of any localized trouble. Worm medicine was administered with successful results, and it was concluded that his lassitude was probably due to worms. He was first noticed to limp slightly about the end of August; but the lameness wore off with exercise. As the weather was very damp about that time, the owner thought it was rheumatism. During September the lameness increased, and he frequently licked his quarter, indicating the seat of some pain

Femur after maceration.

or irritation. The owner applied fomentation and embrocation, which gave no relief, and up to this time no local swelling was observable. About the end of September pain was localized just about the stifle joint, and on October 9 for the first time a swelling was felt.

On being brought to me on October 13 I examined him, and found an enlargement of the junction of the middle and lower thirds of the femur. It was fairly tense and quite painful. My diagnosis was ostitis, but I was unable to suggest the nature of the cause. Iodine liniments were prescribed locally, but the lameness and pain so con-

siderably increased that the owner decided to have him destroyed. The swelling had also become much softer, and the ends of the lesion quite mobile. He was accordingly chloroformed and destroyed on November 22.

On *post-mortem* examination a considerable portion of the bony tissue was obviously destroyed, and replaced by a tissue of fleshy consistence, studded with spicules of bone. On microscopic examination the tissue proved to be a round-celled sarcoma. The bone was subsequently macerated for several months, and the soft tissues thus removed. The complete destruction of bone as shown in the photographs was revealed, together with a periostitis extending along the bone in each direction. (Mr. A. L. Sheather kindly took the photographs for me.)

ASSOCIATION OF VETERINARY OFFICERS OF HEALTH.

The Association of Veterinary Officers of Health are to hold their annual meeting this year in the Municipal Buildings, Glasgow, on Thursday, September 29. The list of contributants who have promised papers is a very distinguished one, and ought to afford a literary treat to all veterinary officers of health. The subjects to be dealt with are: "The Eradication of Bovine Tuberculosis," by Professors Bang and Ostertag (discussion will be opened by Mr. J. Malcolm, F.R.C.V.S., Birmingham); "Fungi on Flesh and other Foods in Relation to the Fitness of such Foods for Human Use," by Professer Glaister, Glasgow University; "Malignant Diseases in the Lower Animals," by Dr. Murray, of the Imperial Cancer Research Fund; and "The Relationship of Scarlet Fever, Diphtheria, and Sore Throat of Man to the Affections of the Udder of Cows," by Professor Gofton, of the Royal (Dick) Veterinary College, Edinburgh. The President this year is Mr. J. S. Lloyd, Veterinary Officer of Health for Sheffield.

It is earnestly desired that this Association, which is comparatively young, should be supported by every veterinary officer of health, and applications for membership should be sent direct to the Secretary, A. M. Trotter, M.R.C.V.S., Moore Street Abattoir, Glasgow.

Abstracts and Reports.

A CASE OF TETANUS IN A MAN TREATED WITH SUBCUTANEOUS INJECTIONS OF MAGNESIUM SULPHATE: RECOVERY.

By PETER PATERSON, M.B. Glasgow,

Surgeon, Royal Infirmary, Glasgow.

Since Meltzer, in 1905, showed that paralysis of nervous tissue could be induced by magnesium salts, a considerable number of tetanus cases have been treated with solutions of this salt and with highly gratifying results. The majority of the recorded cases have been treated by subarachnoid injections, while in a few the salt has been introduced into the subcutaneous tissues, but in most, if not all, these injections have been regarded as supplementary to the serum treatment. Wassermann, Babes, Kowalski, and others have had encouraging results from frequently repeated subcutaneous injections of a fine emulsion of rabbit's brain in normal saline solution. This fresh nervous matter acts, in all probability, by combining with the tetanus toxin circulating in the blood, and thus its absorption by the nervous system of the patient is prevented; it can have no action on the toxin already fixed in the patient's nerve cells. Magnesium sulphate, again, has no effect on the toxin, either fixed or free; hence, so long as toxin is being formed at the seat of infection, injections of this salt do not prevent its absorption by the nervous system. It only acts by controlling the spasms, and, by conserving the patient's strength, gives him time to form his own antitoxin. If, then, both brain emulsion and magnesium sulphate were injected at the same time, it seems to me that the patient would have a better chance of recovery than when only one of these is administered, as the magnesium salt would diminish the spasms produced by the toxin already fixed, whilst the brain emulsion would prevent, or at any rate diminish, absorption.

In the case of which the following is a short summary only the magnesium salt was employed. The patient, a coal-miner, aged 21, was admitted to hospital three weeks after he had received a small wound on the scalp from a kick. This wound must have been a very superficial one as it healed in a few days and left no visible scar; in fact, it is doubtful if this actually was the seat of infection as his hands showed numerous small cuts and abrasions, any one of which might easily have given entrance to the bacillus. The symptoms commenced six days before admission with pain and stiffness in the abdominal walls and muscles of the back. These pains gradually became worse, till on the morning of admission he had a "convulsion" which lasted about five minutes. When brought under observation the whole body was rigid, with the exception of the forearms and hands. Opisthotonos was well marked; the legs could not be moved, and the incisor teeth could be separated for about an eighth of an inch only. All the affected muscles were very hard. He complained of severe and continuous pain across the upper part of the abdomen and down both legs. Superadded to the tonic contractions of the muscles there were almost continuous cramp-like spasms. Every two or three hours these became very severe, and implicated, not only the muscles

of the trunk and limbs, but also those of respiration, so that breathing was suspended, the face became cyanosed, the pupils dilated, the pulse thready, and occasionally consciousness was lost. The temperature was 100° F., the pulse 96, and of moderate tension. A count of the white blood cells gave 12,000 per cubic millimetre, of which 84 per cent. were polymorphs. Perspiration was free but not excessive. The urine was free from albumin. During the night he was very restless and did not sleep.

The following day he received a subcutaneous injection of 10 c.c. of a 10 per cent. sterilized solution of magnesium sulphate, 5 c.c. being introduced into each thigh. Soon after this injection he obtained an hour's sleep, the first he had had for forty-eight hours. These injections, which were repeated every four hours, night and day, for two days, gave him so much relief that he frequently cried for them, even though they were very painful. After two days of this treatment the comparatively slight and more frequent spasms had almost entirely disappeared, the pain had become much less acute, and the severe spasms had become less frequent, there being one only every five to twelve hours, instead of every two or three hours as formerly. As these were still so severe as to threaten life the dose of the magnesium sulphate solution was rapidly increased till 20 c.c. were administered at one time, 10 c.c. being injected into two separate parts of the body at one time. This increased dose was repeated every four hours and continued for four days. The effect of this treatment seemed to be a prolongation of the interval between the spasms, there now being only one, or at most two, in the twenty-four hours. The rigidity of the jaws, abdomen, and back was still present, but that of the legs was passing off, as he was able to draw them up in bed, though with difficulty. The injections were now stopped, partly because the spasms were diminishing in frequency and partly because he was strongly objecting to the pain they caused him. The day after the treatment was stopped an erythematous rash appeared over his shoulders and gradually spread, till three days later the greater part of the body was covered; it then began to fade and a week later had disappeared. This rash did not give rise to any evident constitutional symptoms. At the same time he suffered much distress from a collection of viscid saliva at the back of his throat. This mucus could not be swabbed away as he could not open his mouth sufficiently to permit this, and he was afraid to cough it up in case the exertion should produce a spasm. The last severe spasm was recorded three days after the injections had been stopped, and though he still had at long intervals slight attacks of cramps, his chief complaint was the pain resulting from the injections. The rigidity was now becoming less marked, though it varied in degree from time to time, At one visit the legs, for example, could be moved quite freely, while at the next movements could only be performed with difficulty. Evidently relaxation was not a continuous process, but was interrupted by a series of long drawn out, painless, and ill-defined waves of tonic contractions, slight in degree. The abdominal muscles were the last to lose their board-like rigidity.

The patient left hospital five weeks after admission. When seen three weeks later he was about to return to his work. Throughout his illness he could swallow without difficulty, and as his thirst was great

he was able to take a large quantity of nourishment. The thirst was specially marked during, and for a few days after, the administration of the injections. During this period he took on a daily average 8 to 10 pints of fluid, consisting of strained soup, milk, water, and an occasional beat egg. The quantity of urine was not increased, but he lay soaked in perspiration. The latter may have accounted for his thirst, though the introduction of so much salt into the circulation may have been partly responsible. The bowels moved two or three times daily, and the motions were inclined to be loose. The temperature never rose above 101° F., but it did not fall to normal till four weeks after admission, and fully a fortnight after the spasms had ceased. The pulse varied from 100 to 120, except during a spasm, when it would mount to 130 or 140 per minute.

It would have been safer, perhaps, to have continued the injections for a day or two longer, but they were stopped for the reasons already mentioned. The great objection to this method of treatment is the pain produced by the injections, but I think this could be overcome to a considerable extent by using larger quantities of a weaker solution. —*Lancet.*

A DISEASE OF SHEEP IN TASMANIA.[1]

By J. A. GILRUTH D.V.Sc., M.R.C.V.S., F.R.S.E.

Professor of Veterinary Pathology in the University of Melbourne.

BACTERIOLOGICAL INVESTIGATIONS.

Microscopical examination of smears made direct from the various effusions, the heart, blood, spleen, kidneys, &c., of the sheep dead some time before *post-mortem* examination showed a profuse bacterial flora in each. The subcutaneous œdema contained, (1) a bacillus, often in chains of from 4 to 6, with square extremities, not unlike anthrax bacilli, but smaller and narrower; (2) a bacillus, often in pairs, some sporulating; (3) several long thin bacilli with terminal spores; and (4) a large sporulating bacillus, probably putrefactive. The heart-blood contained the above types of bacilli, and also a long filamentous organism like the bacillus of malignant œdema. The effusion from the peritoneal cavity contained all the above bacilli, with, in addition, some cocci and short bacilli. The spleen, kidney, and pleural effusion also showed a number of bacteria, the commonest being the double bacillus sporulating, which definitely stained by the method of Gram.

The smears from the sheep which was killed for examination showed apparently no organisms present in the blood, the spleen or pleural effusions; the slides smeared with the peritoneal effusion had become accidentally broken in transit, and could not be examined. The smear from the necrosed surface of the stomach (abomasum) showed a fragment of a very small nematode, probably Trichostrongylus (Str. Ostertagi, &c.), and masses of various kinds of micro-organisms, including various bacilli and cocci.

[1] The paper by Professor Gilruth dealing with this disease was published in the VETERINARY JOURNAL for May.

That the fluids were not absolutely free of bacteria at the time the animal was slaughtered was proved by incubation of the sterilized pipettes (which had been filled during the *post-mortem* examination, every precaution being taken to prevent contamination) after my return to Melbourne. The peritoneal and pleural effusions only contained a few cocci, but the spleen and blood contained numbers of bacilli, some sporulating, streptococci, and coccobacilli. The contents of these pipettes, however, were exhibiting no putrefactive odour on being opened.

Guinea-pigs inoculated with small quantities of blood, spleen pulp, and pleural fluid contained in these pipettes remained normal. In view of different and definite results occurring in similar animals simultaneously inoculated with material from the dead sheep, beyond isolating the aerobic organisms, further work with these fluids was postponed.

Microscopical Examination of Stomach of Sheep Killed while Suffering from the Disease.

Although the effusions, blood, spleen, &c., contained at the time of the slaughter so few organisms that none could be detected by microscopical examination of the smears made during the *post-mortem*, yet subsequent microscopical examination of sections of the inflamed and necrosed area of stomach gave interesting and remarkable results.

The mucosa is intensely inflamed, the blood vessels being enormously distended, with frequent small hæmorrhages. The central area of necrosis is found to implicate the whole of the mucosa, including the gastric glands, as far as the muscularis mucosæ. Here and there are small points of ulceration. The necrosed area terminates abruptly at one edge, but at the other gradually extends upwards from the base as a long narrow triangular area, covering intensely injected and inflamed tissue.

The submucous connective tissue is infiltrated with fibrinous exudate, causing the folds to be considerably distended, its blood vessels are intensely injected, and the blood corpuscles definitely hæmolysed in the hæmorrhagic areas.

On the surface of the inflamed and the necrosed areas are numerous bacteria, such as cocci, coccobacilli, and bacilli, but deep in the necrosed area, and more especially throughout the œdematous submucosa, are solely masses of bacilli, Gram positive and otherwise morphologically similar to those demonstrated to be the cause of the disease. Where the bacteria are most numerous there are small agglomerations of leucocytes, but generally the tissue is remarkable for their absence.

Here undoubtedly was the region where the bacteria had become introduced, probably by means of the parasite already mentioned, and where they had enormously multiplied and elaborated the toxin or poisonous principle which is the principal cause of such diseases.

Experiments with Material from Dead Sheep.

A guinea-pig, No. 1, was inoculated underneath the skin of the thigh with two drops of blood. Next morning (twenty hours later) the animal was found dead and cold, death having occurred some hours previously.

There was intense swelling of the whole of the inoculated limb, the opposite limb, and the subcutaneous tissues of the abdomen. The skin of the inoculated thigh was black, and gangrenous. Underneath the skin was found a large quantity of blood-stained serous exudate, with a decided putrefactive odour. On opening the abdominal cavity the uterus, which was gravid, showed a large patch of extravasation, affecting the border near the inoculated limb. There were, however, no effusions in any cavity, and the internal organs were normal, with the exception of the liver and kidneys, which were slightly congested. Microscopical examination of the subcutaneous œdema showed masses of bacteria, chiefly of the form classed as (2), but also numbers of the other varieties. The spleen and liver contained similar organisms, but the blood of the heart was apparently free.

A pipette filled with heart-blood after incubation developed some long sporulating bacilli and cocci. That these bacilli were not pathogenic organifms was proved by inoculating a guinea pig (No. 4) with two drops of the contents of the pipette without result.

Guinea-pig No. 2.—As it seemed possible this guinea-pig 1 might not have succumbed but for the advanced pregnancy, guinea-pig 2, which had previously been inoculated with two drops of the blood from the second (killed) sheep without any result, was again inoculated in the opposite thigh with two drops of blood from the dead sheep. Death resulted under twenty hours. In this case *post-mortem* showed no necrosis of the skin, little putrefactive odour, and much less subcutaneous œdema. The liver showed one or two small areas of necrosis, but otherwise the internal organs were normal. Microscopic examination of the subcutaneous fluid, &c., demonstrated bacteria similar to those found in guinea-pig 1.

At this stage it was deemed wise to test the material from the dead sheep on another sheep.

Sheep No. 1.—Accordingly a crossbred ewe about 18 months old, in good condition, was inoculated subcutaneously in the region of the groin with 0·2 cc. material, composed of equal parts of spleen-pulp and pleural effusion. The injection was made at 5.30 p.m. on July 2; 3rd, there was slight lameness and increase of temperature—103-5; 4th, lameness increased, leg being carried, the skin of thigh puffy and of slight bluish-red tint. Animal dull, with no appetite; temperature 103·5; 5th, condition as during previous day, temperature 103·5. During the three following days the general condition improved and appetite returned, though lameness increased somewhat, the livid colour became more pronounced, and the inguinal glands were swollen. The temperature remained constant at about 103·5. On the 10th the swelling showed signs of becoming circumscribed and firmer, while the glands also became much smaller and harder. After this the local swelling gradually improved, the swelling of the glands slowly disappeared, until on the 17th the only local change that could be detected was a slight depression as if a scar had formed and the lameness had entirely disappeared.

It was evident that in the small quantity of material introduced under the skin of this sheep there was present amongst the different organisms already mentioned at least one capable of setting up serious disturbance. The recovery of the animal may have been due to a natural partial immunity, or to the possibility of the mixed organisms

inducing a greater reaction than a pure culture. As will be seen later, this latter was probably the correct explanation.

Guinea-pig No. 10.—Ultimately the sporulating Gram-positive bacillus was secured in a practically pure state by passage through a guinea-pig (10). This animal was inoculated with a very small quantity, 0·05 cc., of subcutaneous exudate from guinea-pig 1. Death occurred thirty-one hours after inoculation, and *post-mortem* examination was made immediately. There was much swelling of the inoculated limb, the opposite limb and the subcutaneous tissue of the abdomen. The seat of inoculation was slightly gangrenous. There was a slight odour of putrefaction at the point of inoculation, but elsewhere it was absent. The œdematous effusion was straw-coloured and only slightly blood-tinged, unless in the inoculated thigh, where it was deeply blood-stained. The internal organs were normal, excepting the kidneys, which were congested.

The subcutaneous clearer œdema showed only a short double bacillus, and the larger double Gram-staining sporulating bacillus. The spleen and liver showed only the latter. The blood was apparently free when examined immediately after death, but pipettes of blood from heart developed the sporulating bacillus in a state of almost purity when kept at blood-heat for twenty-four hours.

Guinea-pig No. 12.—As one drop of this blood after incubation caused death, within twenty hours, of a guinea-pig (12) when inoculated subcutaneously, it was evident that the bacillus in question was the one specially pathogenic for guinea-pigs. The general *post-mortem* picture presented by this animal was similar to the previous cases, with the exception that although death had occurred a few hours prior to examination, there was no gangrene of the skin and no putrefactive odour, but a peculiar distinct odour not putrefactive.

The cause of the putrefactive change had apparently been eliminated.

Previously it may be observed that this particular bacillus had failed to grow on ordinary artificial neutral media, although pure cultures had been isolated of two anærobes (one putrefactive and one non putrefactive); also of two aerobic bacilli.

Attempts made to cultivate the bacillus on distinctly alkaline broth from which air was excluded by means of an oil covering resulted in pure cultures being secured from guinea pig 10.

Guinea-pig No. 14.—With ½ cc. of this culture, guinea-pig 14 was inoculated at 1.30 p.m. Next morning at 9 a.m. the animal was prostrate; there was great swelling under the skin of the hind limbs and along the abdomen, with some necrosis just at the point of inoculation. Rapidly the symptoms became aggravated, the animal lay on the side, and exhibited intermittent general spasmodic contractions of the muscles. Death ensued quietly at 10.30, or twenty-one hours after inoculation.

Post-mortem examination disclosed much sero-sanguineous effusion, with a little emphysema, separating the skin from the muscles, and extending forward subcutaneously to nearly the point of the chest. The liver was congested, and the posterior surface showed small areas of necrosis. The kidney was congested; otherwise the internal organs normal.

Microscopical examination showed the subcutaneous effusion at a

distance from the seat of inoculation to contain the bacilli in a state of evident purity; the necrosed liver areas contained enormous numbers; the spleen and blood one or two only here and there, and beginning to sporulate.

Guinea-pig No. 15.—As a control to the above case, guinea-pig 15 was inoculated with ½-cc. subcutaneous fluid (which contained approximately double the number of organisms present in the culture) from guinea pig 10, the same guinea pig from whose blood the organism artificially cultivated had been secured. This animal presented similar symptoms to guinea pig 14, but death did not occur till twenty-four hours after inoculation. Then the *post-mortem* appearances were similar in every way, including the small necrotic areas in the liver.

Now that a bacillus markedly fatal at least to guinea-pigs had been isolated, and cultivated artificially, it was necessary to ascertain if it were equally fatal to sheep.

The sheep previously inoculated with material from the animal which died naturally having been beyond the age found most predisposing in Tasmania, it was deemed advisable to make the experiment first on a younger animal.

Lamb No. 1.—Accordingly a ewe lamb (Down cross) in very good condition and about 8 months old was secured, and 0·5 cc. of the subcutaneous exudate from guinea-pig 14 (which had been inoculated with a culture) was injected underneath the skin of the thigh within an hour of the death of the guinea-pig (14).

Death occurred about eighteen hours afterwards, in the early morning. Unfortunately the message did not reach me till late, but the carcase was left undisturbed till my arrival. There was no evidence of struggling, the animal lying as if asleep. Blood-tinged froth was issuing from the nostrils. The body still retained some warmth, but tympany was marked. Both thighs were swollen and discoloured, and there was considerable emphysema underneath the skin, from the thighs to the axillæ.

On removal of the skin the subcutaneous tissue of the inoculated leg downwards to nearly the hoof across to the other limb and forward to the fore-limbs was infiltrated with a large quantity of effusion. Part of the muscles of the inoculated groin were black, infiltrated with gas, but fairly dry, the muscles surrounding this being pale, degenerated, and œdematous.

The œdematous fluid elsewhere in the leg was but slightly blood-tinged. There was a peculiar odour detected similar to that observed in later guinea-pigs which had died. The odour was not that of putrefaction, nor that of blackleg (which the appearance of the muscles suggested), but a special odour with a faint fishy smell.

The abdominal cavity contained about a pint of turbid reddish effusion. The intestines and stomach showed deep injection of the superficial vessels.

Spleen was somewhat enlarged and pulpy.

Liver: Congested. On the peritoneal surface were granular reddish deposits, and similar material was found on posterior surface of the diaphragm.

Kidneys were both deeply congested and pulpy, the right being the most advanced. The capsules were separated from the substance by

a quantity of gas, and the organs were broken down by large gas bubbles.

Thoracic Cavity: Contained about 10 oz. of deeply blood-stained effusion. The lungs showed intense congestion, especially of the apices. The trachea and bronchi showed marked blood-staining of the mucous membrane, and contained a quantity of frothy bloody material.

The pericardium contained about an ounce of bloody effusion. The heart contained a quantity of rather tarry-looking blood, and the endocardium was congested.

It was noticeable that the carcase itself emitted practically no odour, and that my hands only retained a marked "muttony" smell.

Microscopical examination of fluids and tissues from all portions of the body showed the presence of numbers of the characteristic bacilli, many sporulating. They were especially numerous between the muscle fibres of the necrotic dark-coloured muscular tissue. In the peritoneal and thoracic effusions a few thinner bacilli Gram negative were found, but the blood and pericardial fluid especially contained the typical bacilli in a state of evident purity.

This showed a tremendously rapid growth of these bacilli, which in less than twenty-four hours after introduction were to be found in every part of the body. To test if those present in the pericardial effusion were exactly of the same nature as those inoculated, guinea-pig 16 was injected with two drops of this material at 3 p.m. Next morning at 9 a.m., or in less than eighteen hours, the animal was found dead. The *post-mortem* appearances were exactly as in previous cases, including the necrotic areas of the liver, &c.

Virulence of Culture for Sheep.—A few-hours-old anaerobic broth culture of the bacillus found in the peritoneal effusion of the lamb was employed in this experiment. The number of organisms present was only sufficient to show a faint cloudiness on very careful examination, therefore the doses were extremely small. 0·25 cc. (about 4 drops) of this culture was injected into each of the following sheep:—Lamb 2, of the same age and breed as the previous lamb; sheep 1, which had been previously inoculated with material from the dead sheep and had recovered; and sheep 2, which a week previously had been inoculated with a culture of another anaerobic organism isolated from the dead sheep without any deleterious effect whatever. The inoculations were made at 5.30 p.m., the subcutaneous tissue of the thigh being chosen.

The following is the result of these inoculations:—

Lamb 2.—Next morning the animal was dull, with no appetite, moved when disturbed, but was slightly lame, the seat of inoculation showing a slight puffy swelling somewhat hot but not painful; temperature, 104. At 11.30 the dullness had increased, as had the lameness when disturbed. Swelling slightly larger, and respiration increased; temperature 105·4. By 12.30 the leg was carried during movement, the face had a pained expression (if the term may be employed). The animal showed a tendency to uneasiness, neither lying down nor standing up for any great length of time. The breathing, especially when lying, was very rapid, reaching 120 per minute; the pulse was wavy and dicrotic; temperature 105·4. At intervals there was a peculiar grinding of the teeth. Up till 5.30 the condition remained very much

the same, the swelling had increased but little, the pulse and respirations remained as before, as did the temperature. At 9.30 there was little change. The leg was distinctly swollen down to the hock, due to the presence of a clear effusion, as proved by an exploring needle. The temperature had fallen to 104·4. At 6 a.m. on the following day the animal was found dead. Death had resulted even from such a small dose in less than thirty-six hours.

Post-mortem Examination.—The inoculated thigh was much swollen, but showed little discoloration. There was much œdematous infiltration throughout the whole limb, practically to the toe. Around the point of inoculation the effusion was blood-tinged, but elsewhere straw-coloured. The muscles of the inner side of the thigh were dark, almost black, in colour, broken down by gas, and emitting the peculiar odour remarked in lamb 1 and in the later guinea-pigs. Around the dark-coloured area the muscles were degenerated, pale and œdematous.

Abdominal cavity contained about 8 oz. of blood-tinged effusion. The peritoneal surfaces of the abomasum and intestines were injected. The liver congested, and showed a small area of necrosis similar to those in the guinea-pigs. The kidneys were markedly congested. Spleen normal.

Thoracic cavity contained about 6 oz. straw-coloured effusion, with gelatinous masses adherent to pleural surface of lung, and causing adhesions between the lobes. The fluid, on exposure, rapidly became of a jelly-like consistency. The lungs were congested, and along the course of the vessels the perivascular connective tissue was markedly infiltrated with a gelatinous straw-coloured exudate. The pericardium contained about 1 oz. of slightly blood-tinged fluid. The epicardium, especially on the superior portion, showed numerous hæmorrhages; otherwise the tissues were normal.

Microscopical examination demonstrated the presence of numbers of typical bacilli in the affected muscle, the subcutaneous œdema, the peritoneal effusion, &c., but few in the spleen and pleural effusion, while in smears from the heart none could be demonstrated.

Sheep 2 (18 months old; previously inoculated with culture of an innocuous anaerobic bacillus isolated from dead sheep).—Inoculated with 0.25 cc. young culture at 5·30 p.m. Next morning there was slight lameness, but no swelling, disinclination to feed, and temperature 105·4. The animal, which previously had been excitable and wild, was now very quiet, but otherwise there was no symptom of illness. Throughout the day the temperature was frequently taken, and remained about the same. By 5.30 the lameness had increased, and there was distinct swelling of the inner service of the inoculated limb. At 9.30 the dullness, the lameness, and the swelling were more pronounced, and the temperature had risen to 106·5. The following morning the swelling had increased very considerably, and extended to below the hock. The skin was distinctly puffy, but not discoloured. The pulse was dicrotic, the respirations were hurried. The same intermittent grinding of the teeth noticed in the lamb was observed, but the temperature had fallen to 103·4 Death occurred quietly at 1.30, or forty-four hours after inoculation.

Post-mortem examination made within one hour after death disclosed a similar condition to that found in lamb 2. The gelatinous sub-

cutaneous effusion and the area of black degenerated muscle were more extensive. The same peculiar odour was present. The abdominal effusion was small comparatively in amount, not exceeding 2 oz. The peritoneal surface of the intestines was congested; the kidneys and liver were congested, while the spleen was normal. The thorax and pericardium contained each a small quantity of gelatinous effusion. The heart exhibited no sub-epicardial hæmorrhage, but there were several hæmorrhages present under the endocardium.

Microscopic examination showed the presence of the typical bacilli in the subcutaneous and other effusions, the necrosed muscle, &c., as before.

Sheep 1 (18 months old; previously inoculated with small quantity of material from dead sheep, as a result of which severe local inflammatory changes had ensued, followed, however, by recovery).—Inoculated with 0·25 cc. young broth culture at 5.30 p.m. The following day the animal presented a condition very similar to sheep 2, with a slightly lower temperature, varying from 104·5 upwards. There was no marked swelling, but general quietness and loss of appetite. During the second day after inoculation the temperature was lower, remaining about 103·5. The inoculated limb was swollen, as was also the opposite thigh (the seat of the first inoculation). There was some discoloration of both thighs, considerable prostration, rapid respirations, tendency to uneasiness in whatever posture was assumed, and the same intermittent grinding of teeth as observed in the others. At 7 a.m. on the morning of the third day the animal was found dead, having succumbed apparently some hours previously, or less than sixty hours after inoculation.

Post-mortem examination made at 10 a.m. disclosed a condition of the inoculated limb exactly similar to the other cases. The opposite limb was affected with a diffuse subcutaneous caseous area marking the site of the first inoculation.

The abdominal cavity contained about 30 oz. of dirty-looking sero-sanguineous fluid with a slight putrefactive odour. The intestines were injected on the peritoneal surface, and under the peritoneal covering exhibited great numbers of small bubbles of gas (evidently due to the growth of putrefactive organisms through the wall from the intestinal contents). Liver and kidneys congested; spleen enlarged and pulpy.

Thoracic cavity contained about ½ pt. of sero-sanguineous effusion, and the pericardium about 2 oz. of fluid the colour and consistency almost of blood. The lungs were normal. The heart showed some small sub-epicardial hæmorrhages, while the endocardium was deeply congested.

Microscopical examination of the subcutaneous effusion, affected muscle, the pleural exudate, and the blood showed typical bacilli alone, but the peritoneal fluid and the spleen besides these typical bacilli showed the presence of long filamentous organisms which had evidently gained entrance from the intestines, and were the cause of the distinctly putrefactive odour.

The bacillus was recovered pure in cultures from these cases.

A guinea-pig (No. 17) inoculated with 0·2 cc. broth culture from lamb 2 died in nineteen hours. The *post-mortem* appearances (the examination being made immediately after death) were similar to those found in previous guinea-pigs inoculated with fluids, with the exception

that at the seat of inoculation there was no trace of gangrene, there was little gas, and the effusion, except just around the point of inoculation, was practically free from blood-discoloration. There was some typical peritoneal fluid (sero-sanguineous, rather dirty-looking), and the liver showed the usual necrosed patches.

Rabbits.—A rabbit inoculated at 5.30 p.m. with 0·25 c.c. broth culture from lamb 2 was dead the following morning at 9.30, or in sixteen hours.

Post-mortem examination.—Large œdematous swelling affecting inoculated leg extending almost to the foot. There was no discoloration or odour. The subcutaneous effusion was clear and straw-coloured, being only blood-tinged near the inoculation puncture. The muscles were very dark in colour, and broken down with some gas formation. The internal organs were normal.

Microscopic examination of subcutaneous fluid showed numbers of typical organisms; in the degenerated and black muscle tissue they were very numerous, and many sporulating. The spleen contained very few, while the blood was free, and remained so even after incubation for forty-eight hours. In blood of other animals, though apparently absent, their existence had always been demonstrated by incubation of a pipetteful.

Another rabbit which had previously been tested with two non-pathogenic bacilli isolated from the original sheep also succumbed in under eighteen hours to an inoculation with the specific bacillus; but in this case there was little subcutaneous œdema, though a small quantity turbid peritoneal effusion was present.

Pigeons.—A well-grown pigeon inoculated at 11 a.m. in the subcutaneous tissue of the breast with 0·25 cc. culture of bacillus from lamb 2 was found dead and cold next morning at 9 o'clock.

Post-mortem examination.—The muscles of inoculated breast were swollen, degenerated, and hæmorrhagic, but exhibiting no odour. Subcutaneous tissue infiltrated with straw-coloured gelatinous fluid. In peritoneal cavity a small quantity of sero-sanguineous dirty-looking effusion; otherwise normal.

Microscopical examination.—Subcutaneous œdema, very few bacilli; degenerated muscles, bacilli very numerous; peritoneal effusion, a few bacilli—all rather longer than those found in sheep and other animals, but otherwise similar. The blood was apparently free; after being in a pipette for only five hours at blood heat, however, a number of gas bubbles were visible; and then microscopical examination disclosed a number present in each "field" of the preparation.

Rats.—An opportunity presenting itself to inoculate a rat, this was done, at the same time and with the same material as was employed to inoculate the three sheep—0·25 cc. broth culture five years old, at 5.30 p.m. Next morning the animal was dull, and showed slight œdematous swelling where inoculated. It escaped when being examined, was kicked, and caught. It did not appear to be worse as a result of the kick. Death occurred at 3 p.m.

Post-mortem examination disclosed an œdematous effusion of considerable extent in the inoculated region, but no other abnormality; the kick, therefore, did not cause serious disturbance. The fluid, on microscopical examination, proved to contain a large number of typical bacilli, and evidently this animal died, as did the others, from toxæmia, or absorption of the toxic products elaborated by the bacilli.

Pigs.—A three-months-old Berkshire was inoculated in the subcutaneous tissue of the thigh with 0·5 c.c. culture. Within twenty-four hours a large œdematous swelling had developed, but without discoloration of the skin, the animal was somewhat lame, and the temperature was 104·8° F.

For three days the swelling gradually continued to increase, extending ultimately forward to the shoulder and downward below the hock. The temperature remained high, and the appetite was small. By the fourth day the swelling had reached its maximum, as had the temperature, which then registered 105·6.

Afterwards the swelling gradually reduced, but the temperature fluctuated above 104° F. On the tenth day recovery, so far as the swelling was concerned, was complete, but for some induration in the fold of the groin, although the temperature still remained above 104° F.

Review.

KOMPENDIUM DER ANGEWANDTEN BAKTERIOLOGIE FÜR TIERÄRZTE. (Compendium of Applied Bacteriology for Veterinary Surgeons.) By Professor F. Glage, Chief Veterinary Surgeon to the Hamburg Veterinary Department.

THIS is a useful and comprehensive text book of 272 pages, destined to help German veterinary surgeons in making microscopic and experimental investigations rendered necessary in the course of their practice. It is published by the firm of Richard Schoetz, Wilhelmstrasse, Berlin, and has sixty figures in the text. The author in his preface writes: "The book submitted should contain in brief, as regards bacteriology, all that interests the official and practical veterinary surgeon and the veterinary surgeon in control of meat and food inspection in the exercise of his calling." We think that the author has carried out his intention, as stated in the preface, very well.

The specific organism of infectious and non-infectious disease is described, and in some cases the clinical symptoms it produces noted. The method of culture, growth, resistency, and pathogenity of the organism are stated, and protective and curative inoculation where usable are discussed.

With regard to the ultravisible, filtrable virus of swine fever and its tenacity to life, Professor Glage writes: "The virus is destroyed in one to four weeks by putrefaction, freezing and drying injure it little, *as well as disinfectants* (1 per cent. of sublimate not in eight days). It is killed by a temperature of 78° C. In the refrigerator the virus is not destroyed in twenty-three days, and in summer heat not in ten days." Inoculation of swine with defibrinated blood is a measure of protective inoculation which the veterinary surgeon can employ, and immunity is said to last for six months. Serum, too, may be used as a protective, but it takes longer to prepare. The doses of defibrinated blood for swine about 45 lb. is 15 c.cm., 45 to 90 lb. 20 c.cm., over 90 lb. 30 c.cm.

The organism of *Johnes disease* is described under chronic pseudo-tuberculous enteritis of cattle. It is stated that the illness attacks cows from the age of two to six years. There is great emaciation, a thickening of the small intestine (seldom of the large) for one or several metres without affection of the mesenteric glands. The organisms are shorter and thicker than tubercle bacilli, lay in clusters and nests, and are colourable by Gram. Cultures have not yet been made, and the bacilli are not pathogenic for experimental animals. One chapter out of nine comprised in the book deals with the subject of *milk control*, which, from a veterinary standpoint, is divided into a hygienic and police supervision. Ropy milk is ascribed to the *microc. lactis pituitosi* (Schmidt-Mülheim) to other micrococci and to *B. viscosus.* The author's views on how slimy milk sometimes arises would be interesting. There are things connected with the origin of this defect that no fellow seems as yet to understand. The chapter is a very useful one.

The book concludes with a very complete index, which is a god-send to a busy and enquiring man.

It will fill a gap in veterinary literature, be useful to those skilled in bacteriological technique, and awaken an interest in the causal origin of diseases, an interest which in the routine of general practice is apt to slumber. The little volume is well bound in a cover that will not easily get dirty, and the illustrations in the text and general get-up of the book are a credit to the firm whose name it bears, viz., that of Richard Schoetz.—G.M.

Miscellaneous.

ROYAL COLLEGE OF VETERINARY SURGEONS.

SPECIAL MEETING OF COUNCIL.

A SPECIAL meeting of Council was held at the College, 10, Red Lion Square, London, W.C., on Thursday, May 19, Sir John McFadyean, President, occupying the chair. The following members of Council were present: Colonel Duck, C.B., Professor Shave, Messrs. Banham, Carter, McI. McCall, Slocock, Stockman, Villar, and Mr. F. Bullock (Secretary).

The Secretary read the notice of meeting as follows:—

"I am desired by the President to invite your attendance at a special meeting of Council to be held on Thursday, May 19, at 3 p.m., when he will propose to the Council, as representative of the whole body corporate, that an address be tendered to His Majesty King George V. to express the condolences of the Council on the death of his Royal father the late King Edward VII., and also to congratulate the King on his accession to the throne. I shall be glad to know, if possible by Tuesday morning next, whether you will be able to attend."

Apologies for absence were received from all the members of Council who were not present, and in each case a cordial agreement with the object of the meeting was expressed.

The President: Gentlemen, the intimation which has just been

read by our Secretary sufficiently explains the purpose for which we are met. Although not forgetful of the fact that it is difficult for many members of Council to attend meetings other than those which must be held in accordance with the by-laws, I felt that it was right and in keeping harmony with the general feeling of the profession which we represent that we should not wait till the annual general meeting or for the next Council meeting for an opportunity to give public expression to our sense of the irreparable loss which has fallen upon us, in common with all the citizens of the British Empire, by the death of our late Sovereign his Majesty King Edward VII. Small as our profession is, compared with some others, it is large enough to admit of its members holding diverse views about many matters, but I am confident that on this subject there is the most complete unanimity. It may be doubted whether any sovereign in history ever earned from his subjects more universal or deeper feelings of loving loyalty and admiration, or was more sincerely mourned when he died, than his late Majesty King Edward.

And mingled with the sorrow which is excited by the consciousness of our share in the national loss is a feeling of deep and sincere sympathy with his Majesty King George V., Queen Alexandra, and the other members of the Royal Family in the necessarily greater sorrow which has fallen upon them. It will, I am sure, be your desire that we should give expression to this sympathy, and at the same time tender to his Majesty King George V. our respectful congratulations on his accession to the throne. We trust that he will be granted strength to bear the burden of his exalted position, that his reign may be long and prosperous, and that when it is ended he may in equal measure with his Royal father survive in the affectionate memories of his people.

I therefore beg to move that a humble address engrossed on vellum be sent to the Home Secretary for humble submission to his Majesty, and that the terms of the address be as follows:—

"The humble Address of the Council of the Royal College of Veterinary Surgeons to His Most Excellent Majesty George V., King of Great Britain and Ireland. May it please Your Majesty, We, the Council of the Royal College of Veterinary Surgeons, assembled in Special Meeting, humbly desire, on behalf of the members of the veterinary profession in Great Britain and Ireland, to be allowed to express to Your Majesty our profound sorrow at the death of our beloved Sovereign, the late King Edward VII., and at the same time to offer our respectful sympathy with Your Majesty and the members of Your Majesty's family.

"We also desire to offer our respectful congratulations on Your Majesty's accession, and humbly to declare our steadfast loyalty and devotion to Your Majesty's person and throne. We pray that Your Majesty's reign may be long, prosperous, and peaceful.

"Given under the Common Seal of the Royal College of Veterinary Surgeons, this nineteenth day of May, 1910.

"*President.*

"*Secretary.*"

The motion, seconded by Mr. Banham, was then put to the meeting, and carried unanimously. The address was accordingly signed by Sir J. McFadyean and Mr. F. Bullock.

Election of Council.

1.	J. Abson	973	7.	J. Dunstan	739
2.	A. W. Mason	938	8.	R. Roberts	681
3.	H. Sumner	888	9.	J. S. Lloyd	631
4.	G. A. Banham	821	10.	J. Clarkson	618
5.	F. T. G. Hobday	784	11.	F. T. Spencer	581
6.	Col. F. Duck	774	12.	W. Packman	493

The first nine have been declared elected. Mr. J. Dunstan was drawn by ballot to take the vacancy occurring as the result of the death of the late President, Mr. S. Locke. Mr. Dunstan will accordingly retire next year.

Examinations in Scotland.

At a meeting of the Board of Examiners held in Edinburgh and Glasgow on May 20, 24, 25, and 26, the following gentlemen passed their final examination :—

Edinburgh College.

Mr. Frank Chambers.
,, David R. Crabb.
,, Thos. J. N. Critchley.
,, Arthur Akin-Higgins.
,, Adam Kerr.
,, Vincent P. Littler.
Mr. Jas. McClemont.
,, A. D. Macgregor.
,, John Nicol.
,, John Plunkett.
,, Charles F. Shawcross.
,, John W. Sugden.

Dublin College.

Mr. Edgar Phair.

Liverpool College.

Mr. Joseph P. Railton.

Glasgow College.

Mr. Gordon McIntyre.
,, Adrian M. Howie.
Mr. David B. J. McCall.
,, David Cooper.

The following passed their third examination :—

Edinburgh College.

Mr. Lindsay A. Auchterlonie.
,, John N. Cooper.
,, Wm. D. Connochie.*
,, William Halstead.
,, Douglas A. Hosford.
Mr. Charles Masson.
,, Robt. E. Murieson.
,, Thos. F. Sexton.
,, Harry L. Torrance.

London College.

Mr. Frank E. Heath.

Glasgow College.

Mr. James N. Reynard.
,, Peter Meikle.
Mr. John Gibson.

The following passed their second examination :—

Edinburgh College.

Mr. Robt. L. Armour.
,, Arthur J. R. Bott.
,, James Conner.
,, Andrew Q. Hall.
,, Robt. L. Lewis.
Mr. William Kearney.
,, Samuel Littler.
,, James McAfee.
,, Charles Nicholson.
,, William W. Peggie.*

Glasgow College.

Mr. H. McD. Paul.
,, Alex. S. Ferguson.
,, John L. Taylor.
Mr. David Keir.
,, Robt. M. Lawson.
,, Thomas Menzies.

The following passed their first examination :—

Edinburgh College.

Mr. George Atkinson.
,, Frank Christopher.
,, John W. Hayes.
Mr. Ronald S. Littler.*
,, John W. Stanley.
,, John D. Tremlett.
Mr. Graham Williamson.

Glasgow College.

Mr. Richard T. Smith.
,, Jas. M. Dawson.*
Mr. James D. Fulton.*
,, William M. Stewart.
Mr. Tom T. Taylor.*

Marked thus * passed with Second Class Honours.

ROYAL (DICK) VETERINARY COLLEGE, EDINBURGH.

On May 23 the annual prize distribution at the above institution took place, the prizes being awarded as follows :—

Class A.

Anatomy : (1) J. W. Hayes, (2) R. S. Little.
Chemistry : (1) R. S. Little, (2) J. W. Hayes.
Biology : (1) J. S. Hayes, (2) R. S. Little.
Practical Chemistry : R. S. Little.
Special book prize presented by Dr. McDougall, G. B. Atkinson; special silver medal presented by Professor Gemmell, F. Christopher.

Class B.

Anatomy : (1) S. Littler, (2) W. Kearney.
Physiology : (1) S. Littler, (2) J. McAfee.
Histology : S. Littler.
Stable Management : (1) H. Thorne, (2) J. McAfee.
Special silver medal presented for Practical Anatomy by Dr. Bradley, S. Littler.

Class C.

Pathology : (1) W. D. Connochie, (2) W. Halstead.
Materia Medica : (1) W. D. Connochie, (2) W. Halstead.
Hygiene and Dietetics : (1) W. D. Connochie, (2) W. Halstead.
Special prize for Practical Pathology presented by Dr. Leighton, L. A. Auchterlonie.

Class D.

Surgery : (1) F. Chambers, (2) D. R. Crabb.
Meat Inspection : F. Chambers.
Clinique : (1) D. R. Crabb, (2) H. G. Lowry.
The College Bursary of £21 was won by H. Fraser; the Macfarland Medal by F. Chambers; the Edinburgh V.M.A. Medals were won by F. Chambers and D. R. Crabb.

Translations.

WEIGHT OF THE HEART AND LUNGS OF HORSES.

BY DR. FREIHERR.

Lutzow.

THE author has undertaken a great number of measurements and weights in horses which he has published in a comprehensive work entitled "Comparative Anatomical and Physiological Examinations in Light and Heavy Horses." From the copious material the following may be given :—

	No. of Animals Examined	Average Weight of the Heart	Proportion of Heart Weight to Living Weight	Average Weight of Lungs
		g. lb.		g. lb.
East Prussia :				
Lean mares	42	3,690 = 8·13	1 to 137	7,150 = 15·76
Fat mares	32	3,415 = 7·52	1 ,, 252·5	6,690 = 14·74
Lean geldings ...	28	3,620 = 7·97	—	6,960 = 15·33
Fat geldings... ..	21	3,620 = 7·97	—	6,840 = 15·07
Danish	26	3,560	—	7,640
East Prussia :				
Light military horses	28	4,310	1 ,, 99·0	5,510
Heavy military horses	30	4,700	1 ,, 114·0	7,600
Belgian :				
Lean mares	27	4,100	—	7,460
Fat mares	23	3,960	—	7,360
Lean geldings ...	20	3,850	—	7,470
Fat geldings... ...	35	4,140	—	7,770

(*Deutsche Tierärztliche Wochenschrift.*)

ABSCESS FORMATION OF THE SUBLINGUAL GLANDS IN A HORSE AFFECTED WITH FARCY OF THE FACE.

BY PROFESSOR LIENAUX.

Brussels.

ONE knows that the formula that "the glands in glanders never suppurate" has its exceptions, but these are rare enough to be noted. A cab horse, of English descent, entered the college with farcy of the face. On the right side the cheek bore a large wound at its edge of irregular depth. There was a pasty swelling which was continuous into the maxillary fissure and extended up to the glands of the space. Between these and the ulcer œdema developed in the track of the lymphatic vessels, presenting several hard nodules of the volume of a pea. No discharge or appreciable lesion whatever of the usual cavities. After two days the distinct nodules opened and gave exit to white thick pus. Suppuration of the glands caused a doubt as to the nature of the lesions, but this was confirmed by examination of

the bacillus, malleination, inoculation of the guinea-pig, and serum diagnosis. Only a small number of nodules were found in the lungs. The suppurated foci of the sublingual glands were filled by cicatricial tissue; there did not exist in these glands any other trace of glanders lesions, old or recent.

(*Revue Générale de Médecine Vétérinaire.*)

PERINEAL HERNIA OF THE DOG.

By HÉBRANT and ANTOINE.

Brussels.

Dogs affected with perineal hernia present under the anus a rounded and soft tumour, often the size of a fist, little sensible, and easy to reduce. The contents are formed by the bladder, inverted or not, by the uterus, the epiploöm, or the rectum doubled up or dilated, or by several of these organs at the same time.

The bladder, when full, will give a sensation of fluctuation, and the tumour will diminish after micturation. If it is the rectum which is involved, obstinate constipation will be present, with cries when attempting to defecate, and the finger introduced into the anus will discern a deviation or dilatation of the viscera. The same rectal feeling will make clear the state, volume, and position of the prostate. If it is the epiploön which forms the hernia, the fingers will have the sensation of very mobile superimposed membranes. The womb will give the impression of a hard organ prolonging itself into the pelvis and without continuity with the anus.

The best appropriate treatment to bring about radical cure is a double surgical intervention: (1) Resection of the hernial sac; (2) fixation of the herniated organ in its normal position. These two operations have been employed separately, but then the cure is only temporary.

One proceeds as follows: The animal is fasted twenty-four hours; the regions of the perinæum, belly, and flank are asepticized; anæsthesia is produced. The hernial sac being opened one can assure diagnosis. The herniated organs are pushed back, and a strip of the sac, as large as possible, cut out from each side of the wound. Interrupted sutures are placed through its edges; the one set deep, of catgut, reunite the thickened peritoneal lips, the other, superficial, of silk, draw the edges of the skin together. They are covered with iodoform collodion.

The belly is then opened on the white line if it is a bitch, on the side of the sheath if a male, then the bladder or uterus must be fixed. If it is the rectum to be held, laparotomy is performed in the left flank. The organ is then sought for, and after having scraped it with the aid of a scalpel over a large enough surface, like the internal face of the abdominal wall corresponding to the incision wound, one fixes it to the latter at several separated points, transfixing the musculosa of the organ which one wishes to fix. It is our custom, for a large dog, to pass five suture points at the distance of a centimetre from one another, of which three are of black silk (two of which are at the ex-

tremities) and two of catgut. We prefer black silk because it is easy to find in the wound when necessary to be removed. On the abdominal wall side the suture points are put through, not only the peritoneum, but also the muscle. The cutaneous lips are turned down on the wound and fixed provisorily to each other by two or three suture points; the whole is covered with iodoformed collodion, and protected with a body-bandage of gauze and aseptic wadding. After six or seven days the black silk sutures are taken out, and the skin is then finally stitched up. During this time, which is necessary for cicatrization of the wounds, the dog remains lying; the pain in the perineal region does not allow him to sit, which is often his temporary habit. After ten to fifteen days the patient can be left to himself.

(*Revue Générale de Médecine Vétérinaire.*)

Instruments and Drugs.

A NEW DRENCHING TIN.

By SYDNEY SMITH, Jun., M.R.C.V.S.

May I bring to the notice of your readers a drench tin which I have invented? In shape it follows the usual conical pattern, but the chief features of the invention are removable screw caps at each end of the tin. The advantages may be summarized as under:—

(*a*) With both caps removed the tin is easily cleaned.

(*b*) The tin can be filled at the big end. This is of especial advantage in the case of viscous fluids, such as treacle or gruel.

(*c*) When powder drenches are used, mixing can be brought about inside the tin.

(*d*) In all cases it is possible to see the exact height of the contents, and thus the risk of spilling over is obviated.

They are made in two sizes, and the prices of the tins have been fixed at a low figure. The sole makers are Messrs. Huish, of Red Lion Square. I may add that it is provisionally protected.

JAPAN-BRITISH EXHIBITION.

In presiding over the inaugural meeting of the International Congress of Applied Chemistry last year, His Majesty King George V., then Prince of Wales, emphasized the value of scientific research. "The rule of thumb is dead, and the rule of science has taken its place."

This has long been recognized by Burroughs Wellcome and Co., who, at a time when the supremacy of British chemical industries was being challenged by other nations, stepped forward and by the excellence of their products proved to the whole world that they, then as now, have always laid the greatest stress upon the " rule of science."

The results of their investigations into the fields of the unknown are demonstrated in their beautiful display at the Japan-British Exhibition. Their exhibits include many examples of work pioneered by them under great difficulties. As an example may be quoted the fact that the firm were pioneers in the introduction of anti-diphtheric serum in the British Empire, and also supplied the first used in America.

The work of the firm is further illustrated in the series of photographic " tabloids," which includes chemicals not only for development, toning, and other processes. but contains a distinctive preparation in " Rytol "—a universal developer, which is the result of special researches. It possesses a unique range of application.

Untiring, strenuous endeavour and vast expenditure has been required to attain these and other results. It is gratifying, therefore, to be able to record that the firm has received more than 220 highest awards at the great exhibitions of the world for the scientific excellence of their products.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Journal of the Royal Army Medical Corps; Transvaal Agricultural Journal; The Tropical Agriculturist; Bulletins of the Sleeping Sickness Bureau; U.S.A. Department of Agriculture (Bureau of Animal Industry).

Letters and Communications, &c.

Major Walker; Mr. Collinson; Mr. J. S. Wood; Mr. Trotter, Board of Agriculture and Fisheries; Department of Agriculture and Technical Education for Ireland. L. E. W. Bevan.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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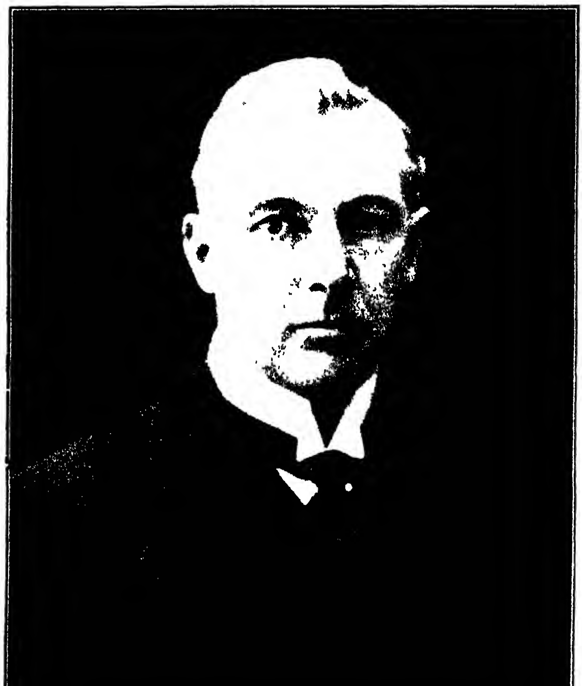

MR. W. FREEMAN BARRETT, M.R.C.V.S., BARRISTER-AT-LAW.
President of the Royal College of Veterinary Surgeons.

THE

VETERINARY JOURNAL

JULY, 1910.

THE PRESIDENT OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

MR. W. FREEMAN BARRETT, M.R.C.V.S., BARRISTER-AT-LAW.

WILLIAM FREEMAN BARRETT was born at Wisbech, Cambridgeshire, and was educated locally. When the time was ripe for him to choose a profession, he determined to become a veterinary surgeon, and consequently proceeded to the Royal Veterinary College, Camden Town, to prosecute his studies. He passed his final examination and was admitted a member of the Royal College in July, 1881. Mr. Barrett's studious nature was not satisfied with this, and he determined to explore fresh fields, and in 1885 he matriculated at the University of London in the first division. He then devoted his attention to the study of law, whilst also practising as a veterinary surgeon in the South of London, and in 1893 he was called to the Bar, Middle Temple, and disposing of his practice, joined the South-Eastern Circuit.

In 1895 Mr. Barrett put up for the Council of the Royal College of of Veterinary Surgeons, and was elected, and has remained a member of that body ever since, being re-elected in 1899, 1903, and 1907. During these fifteen years Mr. Barrett has done incalculable service, both in General Council and in Committee, and was elected Vice-President in 1902, his knowledge of legal matters being particularly serviceable. His election to the Presidential Chair is a fitting climax. His work in connection with the Victoria Veterinary Benevolent Society as Treasurer is very well known to members of the profession.

Mr. Barrett has not limited himself to his professional work. He is a member of the London County Council for Deptford as a Municipal Reformer. He is now Vice-Chairman of the Public Health Committee, and Chairman of the Midwives Act Committee of the L.C.C.

With regard to professional politics, Mr. Barrett has always made for advancement, and although for some time doubtful about the proposed new Bill, he has given a pledge to do his best to get it passed into law. We hope he will be successful in his endeavours, in which case his year of office will form one of the most momentous in the history of the veterinary profession.

Editorials.

THE NATIONAL VETERINARY ASSOCIATION.

BEFORE another number of the VETERINARY JOURNAL will be issued the meeting of the National Veterinary Association for 1910 will be a thing of the past. We expect this year's meeting, which is to be held in London during the last week of July, will be one of the most successful ever held under the auspices of the Association. No doubt all our readers are aware that Professor Macqueen is the President for the year, and all who know him will fully realize that it will be no fault of his if the success does not even exceed expectations. The subjects selected for discussion are of the greatest importance, and the papers are being prepared by experts in their particular line. "Shivering and Stringhalt" are to be dealt with by Professor J. R. M'Call, and the discussion opened by Professor Wooldridge. "Contagious Granular Vaginitis in Cattle" is a disease about which far too little is known in this country, and yet it is very rife, and is probably one of the most important causes of sterility. This subject will be introduced for discussion by Mr. Ainsworth Wilson, and continued by Mr. Stockman. "Rickets in the Dog" is to be considered in a paper by Mr. F. W. Cousens, who is probably better known by his association with Mr. A. J. Sewell. The discussion will be opened by Mr. H. Gray. The remaining paper is to be on "Strangles," concerning which a lot of work has been carried out lately relative to its prevention. We expect to hear some valuable information on this subject. The paper is to be read by Captain Todd, of the Army Veterinary Corps, and Sir John McFadyean will open the discussion. Thus it will be seen that every taste is to be catered for, and there is promise of much profitable discussion.

This will be the first meeting of the National since the question of reconstitution has been so widely discussed. We have not observed this matter mentioned in the published notices of the meeting, but we think it more than probable that it will be introduced, and no doubt there will be an animated exchange of views. It can hardly be expected that the meeting will give any decision on a question of such importance to its existence at its

first time of discussion, even though many of the members may have discussed it at meetings of various local societies, but we trust there will be an opportunity given for a full explanation of the scheme by the promoters. And when considering the suggestion of amalgamation it would be well to remember our College motto, *Vis unita fortior.*

But the meeting of the National Veterinary Association does not limit itself to serious matters. The social element occupies a not unimportant part of the programme. The annual banquet will be held at the Hotel Cecil on the first evening (27th inst.), while for the second evening and the whole of the third day a programme of amusement is being mapped out by the Central Veterinary Society and the practitioners of the London district. These bodies have set themselves a very high standard on previous occasions, and we are informed that they are making efforts to even surpass it on this occasion.

We understand that a number of seats at the Coliseum are being reserved for the members of the National Veterinary Association at the performance on the evening of the 27th inst., and on the third day the members and their ladies will all be taken to the Anglo-Japanese Exhibition at the White City, where they will be entertained to luncheon at mid-day and to tea later. In this way the enjoyment of the day will be much less dependent on the weather than would be the case in the event of a garden-party or river trip.

For the convenience of members also arrangements are being made for the meetings to be held at the Hotel Cecil, where every desirable accommodation is to be obtained at one centre, and reduced terms are to be given to members staying in the hotel. The unofficial social side of the National meetings has always been very attractive, but in a big city like London there is a danger of this feature being lost unless precautions are taken to preserve it, since members would be likely to put up at widely separated hotels. It is to be hoped that the arrangements being made will prevent this happening, and we hope to find the usual large happy family at the Cecil during the National week. There will be plenty of sleeping and other accommodation at the hotel at that time, since it happens not to be at the height of their season.

Consequently we hope the members will turn up in full force and bring their wives with them, and so make the 1910 meeting the success it deserves to be, both intellectually and sociallv.

THE SO-CALLED SOUTH AUSTRALIAN "DRY-BIBLE."

IN our issue of March of this year we reprinted an official report by the Government Bacteriologist of South Australia on the above subject. It was an interim report, and further particulars were promised, but are not yet to hand. However, our attention has been drawn by a letter appearing on p. 434 to some very serious misstatements in that report, and we hasten to correct the erroneous impressions that may (or rather must) have arisen in the minds of our readers as a result of those misstatements, which refer especially to the number of animals affected. The numbers quoted were certainly alarming, but they appeared to be official. We are very glad indeed to be able to contradict those numbers on the authority of the minister at the head of the Live Stock Department. When compared with the figures furnished by that Department it will be seen that the deaths from this disease, paralysis (the term "dry-bible" is much to be deplored), were only about one-tenth of those quoted for 1908 by Veterinary Surgeon Desmond (2,395 to 232). When, however, we look at the figures for 1907 we are simply astounded at the disparity—viz., 47,480 to 538 ! ! ! No wonder we have received letters of complaint that such figures should have been published. We regret it, but the fault is not ours. On referring to a corrected report which we have received (ordered by the House of Assembly to be printed December 8, 1907), we find the figures 47,480 altered to 3,067, still about six times the number of deaths reported by the Live Stock Department. Since observing these variations and corrections we have looked up the *Journal of Agriculture of South Australia* for the original paragraph quoted by Veterinary Surgeon Desmond, and there we find a most extraordinary juggling of figures. Although in the text 47,480 deaths are said to have occurred from "dry-bible" (a cattle disease) in 1907, yet the table following shows that same number to be the deaths of sheep ascribed to "dogs and foxes." What can we think of such unaccountable confusion of figures? And what can we think

of an investigator adopting and quoting such figures when they are so palpably and absurdly wrong ?

We had not intended criticizing the original "interim" report pending the publication of details, but in the face of the above glaring inaccuracies we feel that we are compelled to do so.

Mr. Desmond's report may be divided into four sections: (1) A history of the official inquiries into the prevalence, &c., of the disease; (2) an account of the symptoms; (3) a very brief summary of his own experiments; and (4) statistics regarding the extent of loss occasioned by so-called "dry-bible."

It will be seen that (4) is flatly contradicted on the authority of the Ministerial head of the Department, and we have already dealt with it. The symptoms and *post-mortem* appearances are considered in such an indefinite manner that even a satisfactory comprehension of the disease or diseases is difficult, if not impossible.

It is, however, Mr. Desmond's account of his experiments that leaves one in a state of bewilderment. "Organisms" are isolated which are numbered 1, 2, and 3, but their nature, morphological and cultural, is never even indicated. A culture of No. 3 is appalling in its effects—*e.g.*, "a few *moments* after injection into a healthy cow there is a shivering fit, and the animal falls to the ground, &c. . . . This lasts only a few moments, and the animal then rises to its feet, 'to present' the following symptoms: Pulse, respiration, and temperature much *accelerated*, &c. . . . Death may take place in from *nine to ten hours*." "Several sheep have been killed with this micro-organism, death taking place in about four hours."

Having after such manner rapidly reviewed his experiments, of which not a detail is given, even such details as the dose and the region of inoculation, Mr. Desmond devotes almost the same space to explaining the "postulates" of Koch, and adds that "all the conditions have been repeated many times in the case of the micro-organisms isolated in the prosecution of this inquiry."

Further quotations from the report are unnecessary. It is more than regrettable that work which of itself may or may not have been good should have been presented to the public in such a guise.

General Articles.

THE RELATION OF THE TUBERCULOUS COW TO PUBLIC HEALTH.[1]

By E. C. SCHROEDER, M.D.V.

Superintendent of Experiment Station, Bureau of Animal Industry, United States Department of Agriculture.

INTRODUCTION.

THE International Congress on Tuberculosis at Washington in September, 1908, expressed the important conclusion, almost without a dissenting voice, that bovine tuberculosis, or tuberculosis among dairy cows, is a menace to public health of altogether too great importance to be ignored.

One result of Dr. Robert Koch's address at London in 1901, in which he announced his view that human and bovine tuberculosis are not identical diseases, and that bovine tuberculosis is a negligible factor for the health of mankind, is the new life that was infused into investigations concerning all phases of the tuberculosis question. Everywhere investigators endeavoured to prove or disprove Koch's announcement, and hence the conclusion of the International Congress in 1908 has behind it the enormous mass of evidence collected during seven long years by diligent, scrupulous, impartial, and intelligent seekers for truth. It is not a hastily drawn conclusion or a conclusion based on inadequate evidence, neither is it the conclusion of a single man or of a few co-workers, but it is the nearly unanimous conclusion of those who are best qualified to weigh the evidence and to judge what it signifies, and hence it is the conclusion on the relationship of bovine tuberculosis to public health which, for the time being, we cannot reasonably refuse to accept.

Though Koch reiterated his former view at the Congress referred to, most of his arguments have fallen. For example, it has been shown that tuberculous lesions in persons, especially children, are frequently due to tubercle bacilli of the bovine type; that tubercle bacilli isolated from human tuberculous lesions may be more virulent for cattle than the bacilli commonly isolated from bovine tuberculous lesions; that tuberculosis of the organs of digestion and associated structures is much commoner than it was formerly believed to be; that the localization of tuberculous lesions in the lungs does not prove

[1] Issued by the Bureau of Animal Industry, United States, America.

that the infection was inspired with the air; that the seat of tuberculosis in the body gives no clear idea of the portal through which the infecting organisms gained entrance; that tubercle bacilli may pass through the intestinal mucosa without affecting it and cause tuberculous processes in remote portions of the body, the lung and elsewhere; that the tuberculous processes in the lung, commonly originate from the finer blood capillaries and not from the finer ramifications of the air channels, and consequently are attributable to tubercle bacilli that reached the lung with the blood stream; that the type of the tubercle bacilli, human or bovine, is not constant, and that the two types of bacilli, human and bovine, are connected by transition forms, so that one type merges gradually into the other.

As tuberculosis is alike the commonest disease of persons and cattle, and as persons and cattle are the commonest victims of tuberculosis, it is important for the protection of public health to know how tubercle bacilli are scattered from the bodies of tuberculous cattle and how they are introduced into the bodies of persons.

Facts shown by Experiments.

At the Experiment Station of the United States Bureau of Animal Industry the following facts were demonstrated :—

(1) The commonest way in which tubercle bacilli leave the bodies of tuberculous cattle is per rectum with the fæces. Tuberculous cattle also expel tubercle bacilli from their mouths and nostrils, directly with their milk, and rarely with their urine. The tubercle bacilli expelled per rectum have their origin in most instances in the lung and throat, from which regions they are coughed up, swallowed, and passed through and out of the digestive canal without loss of pathogenic virulence.

(2) The cattle that pass tubercle bacilli per rectum are not always visibly diseased; about 40 per cent. of apparently healthy but tuberculous cattle, which are not known to be tuberculous until they are tested with tuberculin, intermittently pass tubercle bacilli from their bodies per rectum with the fæces. This work of the Experiment Station has been confirmed by the work of the British Royal Commission on Human and Animal Tuberculosis. (See "Third Interim Report," London, 1909. A comparison of this report with *Bulletin* 99, May 11, 1907, and Circular 118, December 21, 1907, of the Bureau of Animal Industry, United States Department of Agriculture, is interesting.)

(3) The commonest impurity in market milk is cattle fæces. The

amount of fæces in market milk varies from a microscopic trace to a sediment clearly visible to the naked eye. Some samples of milk that show no sediment produce cream discolored precisely like the cream from milk heavily contamineted with fæces; such milk must be regarded as exceptionally dangerous and dirty, but unusually well strained.

(4) The union between cattle fæces and the tubercle bacilli they may contain is not firm. The bacilli are evenly and loosely distributed throughout the entire mass of fæces, from which, when they enter milk, they become datached and float free. Guinea-pigs inoculated with normal, fresh milk from healthy cows to which small amounts of fæces from tuberculous cows were added contracted tuberculosis as readily when the milk was used in a strained as in an unstrained condition; hence tubercle bacilli introduced into milk with the fæces of tuberculous cows cannot be removed by straining.

(5) When milk is allowed to stand for cream to rise, or when cream is separated from it rapidly in a centrifuge, the tubercle bacilli it may contain rise as abundantly with the cream globules as they gravitate with the sediment. This holds true when pure cultures of tubercle bacilli are added to milk, when the tubercle bacilli are added in the form of infected fæces, when they are added in the form of pus from a tuberculous abscess, and when they are present because of a tuberculous condition of the udder. Hence cream from tuberculous milk, volume for volume, contains more tubercle bacilli than the milk. It must be clearly evident from this that no system of purifying milk from bacteria that depends upon gravity or centrifugal force is reliable.

(6) Butter made from cream obtained from infected milk contains tubercle bacilli. This was proven by making butter from the milk of a cow affected with udder tuberculosis and by making it from the milk of a healthy cow to which small masses of fæces from tuberculous cows had been added. The butter on inoculation into guinea-pigs caused typical, generalized, fatal tuberculosis.

(7) The bland, opaque character of butter, either salted or unsalted, forms an ideal environment for the preservation of the life and virulence of tubercle bacilli. Tubercle bacilli were found to show no appreciable attenuation in ordinary salted butter in forty-nine days, to be still highly virulent after ninety-nine days, not to have lost their pathogenic virulence after one hundred and thirty-three days, and to be capable of

causing generalized fatal tuberculosis in guinea-pigs after one hundred and sixty days.

As the investigation of the Experiment Station of the Bureau of Animal Industry to prove the long-retained virulence of tubercle bacilli in butter called out a public criticism to the effect that it was not fair to draw practical conclusions about the persistence of this virulence from the inoculation of guinea-pigs, the following experiment, which may be more convincing, was made: Four healthy hogs, proven to be free from tuberculosis by the use of tuberculin, weighing 125 lb. each, in addition to their regular food were each fed 1 oz. of tuberculous butter daily for thirty days, or one month. Each hog thus received less than 2 lb. of butter during the month, or less than is usually eaten by persons of the same weight. The butter was made with cream obtained from milk naturally infected with tubercle bacilli, and every particle of this butter, which was salted at the rate of 1 oz. of salt to the pound, was three months old, or older, at the time it was fed to the hogs. The hogs were kept under conditions under which no hog among the many used at the Experiment Station ever contracted tuberculosis from an accidental or unintentional cause. As the result of feeding the butter three of the four hogs became affected with typical tuberculosis.

More direct evidence that tuberculosis may be contracted through eating infected food, or more direct evidence to prove that tubercle bacilli may remain alive and virulent in ordinary salted butter for three months or a quarter of a year, would be difficult to obtain.

(8) As as been shown by numerous other investigators, it was found, contrary to the length of time tubercle bacilli live in butter, that they die very rapidly on exposure to light and drying. Sunlight is so potent a factor in the sterilization of tubercle bacilli that it is doubtful whether a sticky, tough substance like tuberculous sputum can reach a sufficiently fine state of pulverization to float in the air as a respirable dust without first losing its infectious character.

The Frequency of Tubercle Bacilli in Milk.

When we bear in mind that probably not less than 20 per cent. of our American dairy cows are to some extent affected with tuberculosis (the percentage among the cows in European countries is much higher) and that fully 40 per cent. of all tuberculous cattle, even when they retain the appearance of health, more or less intermittently expel tubercle bacilli from their bodies with the material (fæces) that is the

commonest, nearly a constant, impurity in milk, we cannot fail to realize that tubercle bacilli must be of frequent occurrence in the milk currently sold for use as human food, and this is precisely what we find to be true when we turn our attention to an examination of market milk.

Numerous tests of milk purchased at Washington, D.C., showed that one among every eighteen samples contained tubercle bacilli, and that one among every ten dealers sold infected milk, notwithstanding that the percentage of tuberculous cows among those from which the Washington milk supply is derived seems, from the tuberculin tests that have been made, to be comparatively low.

Few dairies distribute infected milk continuously. In most instances the distribution is intermittent. This seems to be a matter of some importance, because the extent to which public health is exposed to infected milk depends rather upon the number of dairies that distribute it than upon the percentage of milk samples found to be infected among the number examined, and because experience has shown that it is practically impossible, without an enormous amount of work, to prove definitely that any one dairy constantly sells or distributes milk wholly free from virulent tubercle bacilli. For example, one test of the milk from a dairy at Washington showed it to contain tubercle bacilli. Some time afterwards samples of milk from this dairy were tested on each of thirty consecutive days. Among the thirty samples those of the second, third, and eighth days caused typical, fatal, generalized tuberculosis in guinea-pigs, and those of the remaining twenty-seven days were found to be free from tubercle bacilli. Hence the fact that this dairy was intermittently distributing tuberculous milk would have escaped detection if as many as twenty-two samples of milk, taken on twenty-two consecutive days, beginning on the ninth day of the actual examinations, had been tested.

Professor Eber, of Leipzig, gives some figures which are interesting in connection with the intermittent distribution of infected milk by daries. He tested the milk sold by seventy dealers on three different dates. On the first date six dealers, on the second nine, and on the third seven were found to be selling tuberculous milk. The dealers who sold infected milk on the three dates are not always the same dealers, so that if we sum up the actual number who at one time or another sold tuberculous milk we have the number nineteen, and this is equivalent to the charge that three examinations of the milk sold by seventy dealers showed that 27·1 per cent., or more than one in four, from time to time sold tuberculous milk. Had Eber made a few more

series of tests with the milk of the seventy dealers he probably would have found that even a larger percentage from time to time sold tuberculous milk.

The manner in which tubercle bacilli are expelled from the bodies of tuberculous cattle, frequently long before the remotest symptoms of disease are manifest, teaches that we cannot hope to obtain milk from tuberculous cattle or from healthy cattle exposed in the environment of tuberculous cattle at all times free from tubercle bacilli; and the intermittent character of the distribution of tuberculous milk by dairies teaches that no milk is constantly safe unless it is obtained from cows that have been shown by the tuberculin test to be free from tuberculosis and that are milked, housed, fed, pastured, and in every way kept in an environment from which all tuberculous and all untested cattle are excluded.

Pasteurization as an Expedient.

The amount of milk that can actually be produced under the conditions required to insure its freedom from tubercle bacilli must be, for some time to come, a relatively small proportion of the total supply, and therefore we are obliged to look for some expedient through the use of which milk, when it is not produced under ideal conditions, can be made a safe article of food. The least expensive and most efficient available expedient is pasteurization.

Pasteurization is a definite process, which must not be confounded in our minds with sterilization, scalding, boiling, &c. The proper pasteurization of a delicate, unstable substance like milk, strictly speaking, signifies its exposure to a degree of temperature that will not markedly alter its character for a sufficient period of time to kill nonsporulating disease germs. The minimum effective temperature is 60° C., and this should be maintained at least twenty minutes; the maximum temperature that does not cause objectionable modifications is 70° C., and this is sufficient to kill the disease germs of commoner occurrence in milk in ten minutes. The term "pasteurized milk" should be limited to milk which has been heated between 60° and 70° C. from ten to twenty minutes. Milk heated to a higher degree, or for a shorter period of time, should be defined by some other term. It seems very desirable that some authoritative body, conversant with the milk question, should write a clear definition of just what meaning is to be attached to the term "pasteurized" as applied to milk. Possibly it would be wise to drop the word "pasteurized"

altogether, and to substitute some such term as "hygienically heated milk."

The fact that tubercle bacilli in milk rise as abundantly with the cream as they gravitate with the sediment, and the two facts that the bacilli in cream are transferred to the butter made from it and in butter find an ideal medium for the preservation of their life and virulence, teach that all cream should be obtained from the milk of cows certainly free from tuberculosis, or that it should be pasteurized or hygienically heated before it is used as food in the form of cream or for making butter. It has been conclusively shown that good butter can be made from pasteurized cream.

Though pasteurization is so strongly advocated, we should not lose sight of the fact that it is, after all, simply an expedient, and as such can not be used as a final solution of the milk problem. Above all it should not be used as an excuse for relaxing our efforts to secure milk that is perfectly safe without treatment of any kind, and its use to preserve dirty and otherwise marketable milk should under no circumstances be tolerated. That is to say, so long as the pasteurization of milk and cream is necessary as an expedient to protect public health, let us by all means practice it, but while practising it let us continne to insist that established standards of purity shall be maintained, and that these standards shall gradually be made higher and better.

Some Reasons for Guarding against Infected Dairy Products.

When we consider the sources from which the tubercle bacilli that make tuberculosis the commonest disease with which the human race is affected are derived, it is well to remember that tuberculosis has a unique place among pathological conditions. It is one of the relatively small number of infectious diseases that attack more than one species of animals, and it is the only known infectious disease from which practically no vertebrate species is immune. It has received more attention from investigators in the realms of both human and veterinary pathology, bacteriology, and hygiene than any other disease, and yet our knowledge regarding it has remained in many respects exceedingly rudimentary. We know, for example, so little about its period of incubation that we cannot say who is right—those who believe that tuberculosis arises from infection that may enter the body at any time of life, or those who believe that it almost constantly develops from latent tubercle bacilli taken into the body during the milk-drinking period.

We do know that tuberculous lesions of greater or lesser magnitude and varying stages of activity are found on autopsy with a frequency that prompts the conclusion that few persons wholly escape the tubercle bacillus. We know that tuberculosis is a disease that develops with a peculiar frequency during those periods of life when the drain on the mental and physical forces is greatest, rather than during periods following incidents of exceptional exposure to infection. We know that the children of tuberculous parents succumb to tuberculosis—not necessarily as children—more commonly than those of healthy parents; and we know that tuberculosis is not as common among those persons who have been unusually exposed to infection as we naturally have reason to expect it to be. Men with tuberculous wives and women with tuberculous husbands, when their family records are clean, relative to tuberculosis, contract the disease so rarely that their presumably intense exposure cannot certainly be said to infect them more frequently than persons in general become infected.

We know that tubercle bacilli are peculiar in that they may remain alive and virulent long periods of time in circumscribed closed tuberculous lesions, and we have reasons to believe that actually latent tubercle bacilli may remain in the body indefinite periods of time without causing conditions that can be identified as tuberculcsis; and, finally, we know that sensibly active tuberculosis during child life is an extremely serious disease, and most apt to have a fatal termination.

Add to this that tubercle bacilli in dairy products are either in a fresh or in a well-preserved state; that their introduction into the body is direct and occurs with the use of indispensable articles of food; and that tubercle bacilli in sputum, which were long regarded as the commonest and most active cause for the propagation of tuberculosis, are exposed to conditions that almost certainly sterilize them before the sputum can be pulverized and float in the air; and we may conclude that, whatever chances we, as adults, may be willing to take in the form of exposure to tubercle bacilli in milk and dairy products, we should not be derelict with the exposure of children. It is for the sake of children especially, the little beings whose welfare is a sacred obligation that stands second to nothing, that the fight for pure milk should be made so strong that it will overwhelm every opposition.

NOTES ON TRYPANOSOMES OF THE DIMORPHON GROUP.

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MALCOLM E. MACGREGOR,
Emmanuel College, Cambridge.

In view of the recent attention that has been given to the trypanosomes of the dimorphon type, it may appear unnecessary to recapitulate the circumstances which have given rise to so much discussion. It will be remembered that in 1902 Dutton and Todd encountered in the blood of horses in Senegambia a trypanosome having three forms, namely: (1) A long, slender form with free flagellum; (2) a so-called "stumpy" form; (3) a short "tadpole" form.

Recently, in working with the strain of parasite brought back from Africa by Dutton and Todd, various observers—viz., Thomas, Breinl, Laveran, and Mesnil—have failed to see the long forms with thin body and free flagellum originally described, and it is suggested that Dutton and Todd were dealing with a mixed infection, one of which has died out. Mesnil has expressed his opinion that the original *Trypanosoma dimorphon* described by Dutton and Todd included *T. dimorphon* (*sensu* Laveran and Mesnil), *T. cazalboui* (Laveran), and *T. pecaudi* (Laveran), since these species can occur at one and the same time.

Montgomery and Kinghorn have explained that the trypanosome which Dutton and Todd described did not come from the animal which was the source of all the European strains of *T. dimorphon.* The latter statement arose from the fact that Montgomery and Kinghorn had encountered in animals at Broken Hill, North-Western Rhodesia, the same types of trypanosomes as those first seen by the original observers in Senegambia. The following observations have a bearing on the question.

Blood was obtained by Mr. MacKnight from a cow dying of typical trypanosomiasis at Broken Hill, and inoculated subcutaneously in doses of 40 ♏ into six lacal fat-tail sheep which were sent by rail to Salisbury, in order that a strain might be established for comparison with the trypanosomiasis of live stock in Southern Rhodesia. The sheep were inoculated on February 13, and were received at Salisbury six days later. For the purposes of this note it is unnecessary to give full details of the temperature and trypanosome records of these sheep, but the following table is of interest:—

	Sheep No. 1.	2.	3.	4.	5.	6.
Period of incubation in days	14	15	15	15	17	17
Duration of disease in days	52	35	80	34	80	34

No long form of trypanosomes with undoubted free flagellum was ever encountered in any of these sheep during the whole course of the disease, but the examination of a great number of blood preparations has enabled us to classify the forms met with under the types (*c*), (*d*), (*e*), a system of classification which will be explained later in the course of this note.

From sheep No. 2, 1 c.c. of warm blood was taken on March 12, and was injected subcutaneously into a white rat. On the third day after—somewhat to our surprise, seeing that Montgomery and Kinghorn state the period of incubation in these animals to be six to ten days—we found the blood of our rat to contain a considerable number of trypanosomes. On an average in each field examined under a $\frac{1}{12}$ oil immersion and 3 eyepiece one trypanosome was encountered. Still more surprised were we to find that the parasites met with were of the long free-flagellated variety, and were present in apparently pure culture, since Montgomery and Kinghorn found in their inoculated rats that "tadpole" forms predominated throughout the first few days of the disease. Indeed, from the morphology and short period of incubation, we at first regarded these as *T. Brucei*, a diagnosis which subsequently was proved to be incorrect. During the next few days careful examination of this animal's blood was frequently made, and day by day the long forms with free flagellum became less numerous, while other forms of all gradations, from the long form to the "tadpole" type, made their appearance. The drawings from actual specimens made to scale, but admittedly diagrammatic, show the various types met with, and explain the impression forced upon us that the long type, for reasons unknown, became differentiated or replaced by other shorter types in descending scale until the shortest, or "tadpole," form was evolved.

In the long form, the portion of the protoplasm posterior to the micronucleus was elongated and tapering (*effillée*)—sometimes as long as 5 mm.—but in the descending forms it became shortened and rounded relatively to decreasing total length of the parasite until the rounded end of the "tadpole" type was reached. In the same manner, and in direct proportion to the above changes, the free flagellum shortened and finally disappeared. Similarly, the festooning of the undulating membrane, most elaborate in the longer forms, became gradually less until, in the "tadpole" types, it was almost

inappreciable. But the difference between the nucleus and the micro-nucleus did not appear to decrease in direct ratio to the reduction in the total strength of the parasite, so that in the "tadpole" forms the nucleus was relatively nearer the anterior than in the longer forms.

On this basis we have established a system of classification of the various types under the headings (*a*), (*b*), (*c*), (*d*), (*e*), according to their resemblance to the forms pictured in the drawing. For obvious reasons we prefer this system to the use of the terms "long," "stumpy," and "tadpole." As far as this trypanosome of North-western Rhodesia is concerned, we agree with Montgomery's deduction that: "We

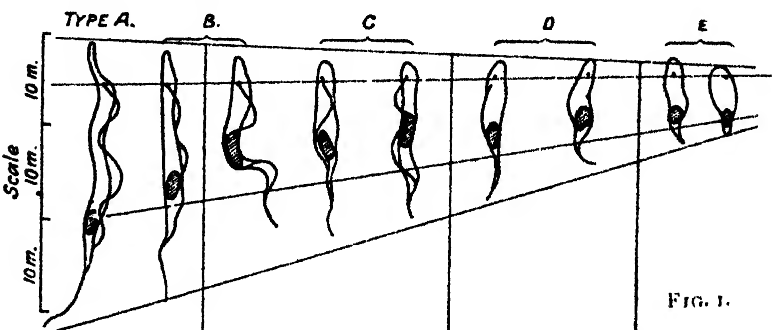

FIG. 1.

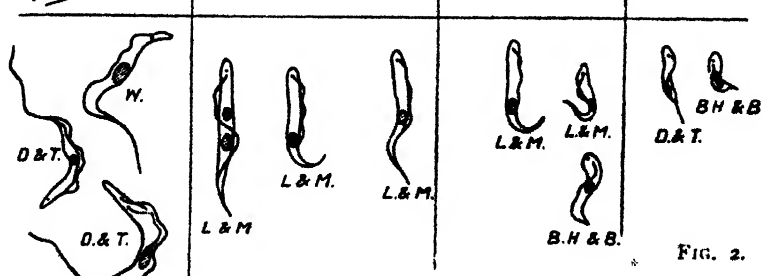

FIG. 2.

FIG. 1.—Drawings of trypanosomes seen in a rat inoculated with the animal trypanosome of North-west Rhodesia, showing transmission from the "long" to the "tadpole" form.

FIG. 2.—Tracings of illustration of *Trypanosoma dimorphon* after various authorities. Scale not uniform.

D. and T. = Dutton and Todd; L. and M. = Laveran and Mesnil; W. = Wellcome Laboratories Report; B., H. & B. = Bruce, Hamerton and Bateman.

have here, then, a trypanosome whose prevailing type is naturally and experimentally infected animals is short, measuring only 9·75 to 15·3 μ, and from which there is a relative absence of a flagellum. This type, under the influence of a different host, or under natural conditions in the same animal, assumes a distinct form, which measures from 25 to 31 μ in length, and possesses a flagellum which may be upwards of 10 μ long."

As far as the species under our consideration is concerned, we prefer to accept this interpretation to the possible explanation that we have to deal with a multiple infection. For if the long form were *T. brucei*, or allied species, we should have expected it to persist, whereas it became replaced by the smaller forms, which in the later stages of the disease were alone present. Further, for us, it would have been impossible to define where the transmission from one type to another took place. We, therefore, submit that our long form cannot have been *T. brucei*, *T. evansi*, *T. lewisi* (which does not occur in the rats at this laboratory), *T. cazalboui* (to which rats are refractory), *T. vivax* (of greater motility), &c., but consider that we were dealing with a parasite which, under certain conditions, assumes various forms, ranging from the so-called "long" type (*a*) to the "tadpole" (*e*).

We are unable to define exactly the factors which give rise to the assumption of any particular type, but from the many observations we have made we are inclined to the opinion that the "long" forms occur when conditions are favourable to the parasite, while the smaller types appear when adverse conditions arise. Thus, in animals which have a natural resistance to the organism, or in cases running a chronic or subacute course, types (*c*) to (*e*) prevail, but these forms introduced to animals which offer little resistance, or in which the disease runs an acute course, are outnumbered by the types (*a*) and (*b*). These, however, even in acute infection, are occasionally replaced by the smaller forms. This is especially noticeable in cases where death is imminent.

Thus it would appear that such circumstances as the production of anti-bodies by the host, or the unsuitability of the medium for the existence of the parasite in the host about to die, give rise to the smaller forms, which may be regarded as "types de résistance."

Applying this hypothesis still further, we would advance the suggestion that the numerous varieties of animal trypanosomiasis met with in the Continent of Africa may have had a common origin, their subsequent minor points of difference having been brought about by natural conditions of passage, transmission, and environment—conditions which have not been duplicated in the laboratory.

ADDENDA.

Trypanosomiasis of Southern Rhodesia.

It may be mentioned that while investigating the course of the animal trypanosomiasis of Southern Rhodesia in naturally and arti-

ficially inoculated animals, we have never encountered forms comparing with types (*a*) or (*c*), as met with in the North-western Rhodesian subinoculation. The Southern Rhodesian trypanosome ranges between (*b*) and (*d*).

Classification.—At the present time there appears to be a desire to simplify the classification of the many described species of trypanosomes of so-called dimorphic type. One of us has received a letter from Colonel Sir David Bruce, in which he writes: "I imagine the type you find in your cattle"—(*i.e.*, Southern Rhodesian)—"is similar to that found by us commonly in Uganda cattle. It seems to me that for the present we should look upon your type, Theiler's Portuguese West Africa trypanosome, the Uganda ones, and the one I described from Zanzibar, as being *for practical purposes* the same species. I also imagine that the trypanosome Dutton and Todd were working with on the West Coast was the same. They were probably dealing with mixed infection, and so got the long forms."

Types de résistance.—Bruce has recently criticized the theory that the "long" and "stumpy" forms of *T. gambiense* represent male and female respectively. Following up our observations on the animal parasite we have been able to apply our theory to the human trypanosome, and consider that the long form predominates where the infection is most severe, and *vice versa.*

MELANOTIC INFILTRATION OF HEPATIC CELLS IN SHEEP.

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At the Melbourne City Abattoir it is not rare to find in otherwise apparently normal sheep the whole of the liver distinctly black or brownish-black in colour. The cause of this condition has so far not been traced, although I am informed by the Chief Inspector, Mr. John Robertson, an extremely careful and reliable observer, that sheep from a certain small paddock in the vicinity some time after a heavy flood are often found to be so affected.

During the first week of July last year, through the courtesy of Mr. Robertson, I had the opportunity of examining five livers exhibiting this peculiar abnormal colour in varying density. Unfortunately, as the animals belonged to different butchers, no definite

information could be secured regarding the exact age of the sheep, or even the district in which the sheep had been bred or fattened.

The livers so far as size, shape, consistency, &c., were concerned were all normal; the sole evidence of disease to the naked eye was the altered colour.

The general appearance of each liver was as follows:—

(1) A diffuse homogeneous dark-brown tint permeating the whole structure.

(2) A darker brown, almost black coloration throughout.

(3) Black or bluish-black at first glance. When examined carefully on section, however, the cut surface was seen to be mottled, each individual lobule appearing to show a small brownish centre with a darker brown periphery.

(4) Black or bluish-black in appearance. When placed in preservative, however, the cut surface developed again a mottled appearance, and careful examination showed this to be due to the periphery of each lobule being decidedly darker than the centre.

(5) Organ homogeneous in colour, being of a distinct uniform black. In this case the organ seemed to be more dense than normal.

The lymph glands of each liver were slightly darker than usual, those of No. 5 being markedly so.

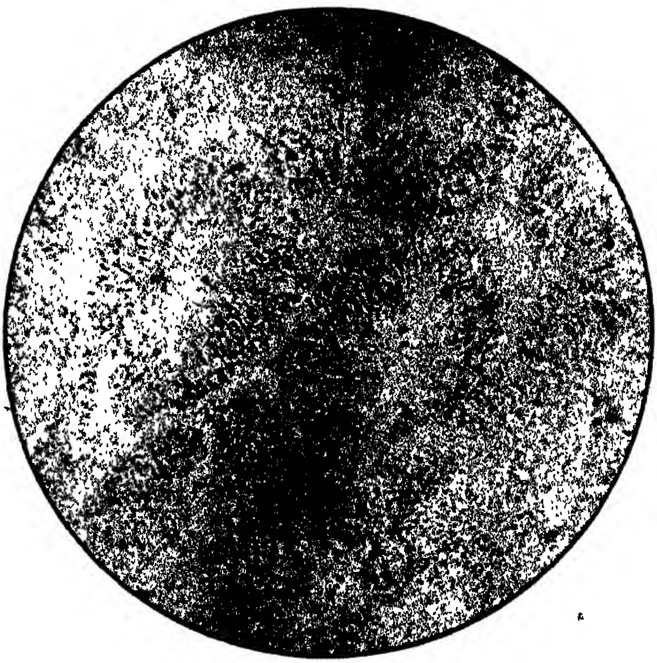
It should be noted that these cases are placed according to the extent of the apparent affection, not as they were encountered. The first three were found last and on the same day. It is well that this should be stated, as otherwise it might be inferred the condition rapidly became aggravated, and that all had become affected in the same locality and about the same time.

It may also be noted that the cut surface, if allowed to rest on paper for some time, soon stained it a dark tint. The nature of the pigment present in the liver was determined by Dr. A. C. H. Rothera, Lecturer and Demonstrator in Biochemistry at Melbourne University, who kindly handed me the following note:—

"The pigment was shown to be neither a bile pigment nor blood pigment, nor yet any pigment usually derived from these. It was insoluble in water, alcohol, or ether, but dissolved in dilute alkalis (1 per cent. NaOH) to form an intensely dark-brown solution. Addition of acid then caused a bulky precipitate, including the pigment. This behaviour is characteristic of the 'melanins'—a class of pigments about which very little is known chemically, or as to their formation. They contain nitrogen, and the class includes the pigments

of the hair, and of black pigment cells, as in the retina; the pigment of melanotic sarcomas, and the pigments so frequently formed in the hydrolysis of proteins."

Histology.—Microscopical examination in each case shows the pigmentation to affect the hepatic cells, principally those of the periphery of the lobules (see photomicrograph). The outer cells are the most severely affected, in some cases the nucleus being almost completely obscured. Gradually passing inwards towards the centre of the lobule, the cells are seen to be less and less affected, although



Section of the Sheep's Liver. × 50.

even in the lightest coloured livers a few distinct granules may be observed in the majority of the epithelial cells.

In addition to the infiltration of the hepatic cells proper, there are present between the rows a number of large free cells crowded with granules, so much so as to completely obscure the nucleus. These pigmented free cells vary in size and in shape, and are evidently situated chiefly within the hepatic capillaries. They may also, however, be seen within the intralobular veins in considerable numbers,

and even here and there in sections of the portal vein. These free cells are evidently white blood corpuscles of macrophage type. In addition to being found in the liver, the lymphatic glands of the organ show these pigmented cells in varying numbers, depending upon the intensity of the liver pigmentation.

It is unfortunate that such cases are only observed after slaughter, as doubtless the blood would give interesting results on examination.

In none of the cases examined did the epithelia of the bile-ducts or the connective-tissue stroma of the organ show any pigmentation. In each liver the pigment is present in the form of small irregular dark-brown granules, which are most readily studied when sections are unstained, or at most stained with eosin alone. Whether the leucocytes which are seen crowded with the granules in the small blood-vessels and capillaries are conveying the pigment to the liver or are removing it therefrom cannot, of course, be determined by these cases; but, in view of what is generally known of pigmentation, the former appears probable, especially as they are evidently becoming entangled, or at least delayed in their passage through the organ.

Records of Pigmentation in Sheep's Liver.

According to Cadeac ("Pathologié Interne, Pancreas, Foie, &c., 1910") a pigmentary degeneration of the liver in Russian sheep has been studied by Siedamgrotzky in 1874, and by Barrier during 1877. Macroscopically the appearance resembles strongly those described above. The colour of the affected organ is "black, bluish, or brownish-black, equally pronounced at the external surface as on the surface of the organ. . . . Sometimes even the coloration is so intense and so general that the preparations give to the water a black colour, as of ink."

The nature of the pigment and the appearance microscopically do not, however, seem to be identical. "One may see the pigment deposit as distinctly in the cells of the organ as in the interstitial connective tissue and the walls of the vessels."

EXPERIMENTS IN CONNECTION WITH THE TREATMENT OF CATTLE AFFECTED WITH REDWATER, WITH TRYPANBLUE, AND TRYPANRED.

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In 1909, Nuttall and Hadwen[1] published the results of experiments which they had been conducting on the use of certain dyes named trypanred and trypanblue, in the cure of canine piroplasmosis. The results obtained were very satisfactory, the latter-named drug being found to have a direct destructive action upon the causal organisms. The use of trypanred was found to have less influence upon the course of this disease.

Towards the end of the year, these observers conducted experiments upon the cure of piroplasmosis (redwater) in cattle. The strain of piroplasm which they used was originally obtained from South Africa in 1904. The experiments were conducted in England. In the experiments performed, nine cows were used, all being inoculated with virulent blood. Five of them were subsequently treated with the drug trypanblue, and four remained untreated—*i.e.*, as controls. Of these, the five treated cows recovered. On the other hand, only one of the four untreated ones died. The authors concluded that "Trypanblau promises to be an efficient remedy for bovine piroplasmosis."

There is no doubt that the use of trypanblue in cases of redwater in cattle gave promise that at last a remedy against this disease, which causes such heavy loss in Queensland, had been discovered. On the other hand, however, it appeared that the experiments in question were not of sufficient severity, seeing that only one of the four untreated animals died, to justify one in concluding that the remedy would be of sufficient value in Queensland to warrant one in recommending its use without further experiment.

One of the reasons for the advisability of experimenting with the drug here, was that redwater varies considerably in its degree of virulence in different parts of the State. In some localities 50 per cent. or more may die from tick fever alone where the cattle are highly susceptible, and the disease strikes the farm with its full force, as it were.

On the other hand, there are many places where either the cattle

[1] A full abstract of the work of these investigators was published in the VETERINARY JOURNAL for January, 1910.

have some slight immunity, or the disease is not so virulent, and the losses are not much more than 5 per cent.

In consequence of this, it will be seen that were cases affected with the disease in a mild form used for experiments, the conclusions drawn from the results might not have the significance one would wish, for one might be attributing to the use of the drug cures which Nature unaided would have effected herself. On the other hand, however, if in the experiments to be performed the most virulent strain of red-water blood obtainable were used, one could justifiably conclude that whatever good effects, if any, the drug had on cattle infected with this blood, the same results, or even better, would follow the use of the drug in cattle affected with the milder form of the disease.

It was with this in mind that the following experiments were carried out at the Experiment Station, Yeerongpilly, during the early part of the present year. The strains of piroplasm used in the experiments were obtained from two sources, viz.:—

(1) *Heifer No.* 18.—Original source-bleeder "S." An animal used for inoculation, and whose blood is known to be very virulent. The blood from No. 18 will be seen in the following experiments to be of very high virulency.

(2) *Cow No.* 28.—This animal was infested on January 19, 1910, with ticks from Geraldton, North Queensland. The ensuing reaction was very severe, and the cow died on February 4, 1910, sixteen days from the time the larval ticks were placed upon her.

Owing to an error on the part of the agents in London, only trypanred was sent out in the first place; as a consequence, the matter being of importance, it was decided to conduct the first experiments with this dye, although it had not proved such a success in connection with canine piroplasmosis as trypanblue. For this purpose four adult cows, Nos. 20, 21, 22, and 23, obtained from a tick-free district (the Darling Downs), were each, except No. 21, which had 45 c.c., inoculated subcutaneously with 50 c.c. defibrinated blood from heifer No. 18. Three—viz., Nos. 21, 22, and 23, were treated with trypanred, whilst No. 20 remained untreated as a control.

The following is the record of the experiment:—

Experiment No. 1, with Trypanred.

Cow No. 21, *aged.* (*Treated.*) *December* 9, 1909.—Inoculated subcutaneously with 45 c.c. defibrinated blood from heifer No. 18. Temperature reaction began on the sixth day after inoculation, and parasites appeared on the eighth day. Trypanred was injected on the twelve day, and death occurred twenty-one days' after inoculation of blood. (See Table I.)

Post-mortem examination did not reveal many lesions of piroplasmosis (redwater). The heart, however, was very flabby and below the normal size.

Cow No. 22, *aged.* (*Treated.*) *December* 9, 1909.—Inoculated subcutaneously with 50 c.c. defibrinated blood from heifer No. 18. Temperature reaction began on the sixth day, and parasites appeared on the eighth day after inoculation. Trypanred was injected on the twelfth day. (See Table II.)

Severe blood lesions in the shape of poikilocytosis, polychromatophilia, punctate basophilia, appeared on the twenty-seventh day, and lasted until the sixty-first day. The blood-count fell to 3,200,000 per c.mm. on the twenty-eight day.

TABLE I.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
6	101·8	102·8	Absent	Normal.	
7	102·4	102·6	,,	,,	
8	102·8	103	Scanty	,,	
9	103·4	104	,,	,,	
10	104·4	104·2	—	,,	
11	104·2	105	Absent	,,	
12	104·6	105·4	Fairly numerous	,,	Cow ill; fæces dysenteric; 2 p.m., 2 grm. trypanred in 100 c.c. water injected intravenously.
13	105·6	105·8	,,	,,	
14	104·4	104·6	Absent	,,	Pulse weak; irregularly intermittent.
15	102·6	103·4	,,	,,	As before; mucous membranes cyanosed; cow very ill indeed.
16	102·4	102·4	,,	,,	
17	102·2	102·2	,,	,,	Cow very weak, but a little better.
18	103·2	103·6	,,	,,	
19	103·4	103·6	,,	,,	
20	102·8	103·6	,,	,,	Cow eating a little, but condition grave.
21	102·8	—	,,	—	Cow moribund; pulse irregularly intermittent and very feeble.

Died 2 p.m. twenty-one days after inoculation.

Cow No. 23, *aged.* (*Treated.*) *December* 9, 1909.—Inoculated subcutaneously with 50 c.c. defibrinated blood from heifer No. 18. Temperature reaction began on the sixth day after inoculation, and parasites appeared on the eighth day. Trypanred was injected on the ninth, and death occurred on the sixteenth day. (See Table III.)

The blood-count fell to 3,800,000 per c.mm. on the thirteenth day after inoculation.

Post-mortem examination revealed typical lesions of acute piroplasmosis (redwater). The urinary bladder contained about a quart of port-wine-coloured urine.

Cow No. 20, *aged.* (*Untreated.*) *Control. December* 9, 1909.—Inoculated subcutaneously with 50 c.c. defibrinated blood from heifer No. 18. In

this case parasites appeared before the temperature showed any marked rise—viz., on the eighth day, temperature reaction commencing on the ninth day. Death took place thirty days after inoculation. (See Table IV.)

The blood-count fell to 2,000,000 per c.mm. on the twenty-ninth day.

Post-mortem examination showed characteristic lesions of chronic piroplasmosis (redwater).

TABLE II.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
6	101·4	104	—	Normal	
7	105·8	106·2	—	,,	
8	105·6	105·4	Scanty	,,	
9	103·2	104·4	Absent	,,	
10	105	105	,,	,,	
11	105·2	105·4	Rings and rods fairly numerous	,,	
12	106·2	107·4	Numerous	,,	10·30 a.m., animal very ill; injected intravenously 2 grm. trypanred in 100 c.c. sterile normal salt solution.
13	105·4	105·8	Absent	,,	
14	103·6	104·2	,,	,,	
15	103·4	103·6	,,	,,	
16	103·8	102·4	,,	,,	
17	101·4	100·8	,,	,,	Cow aborted; animal looks fairly well.
18	103	103·4	,,	,,	
19	102·2	102·6	,,	,,	
20	101·8	102·2	,,	,,	
21	103·4	106·4	,,	,,	
22	101·6	102·6	,,	,,	
23	102·6	102·4	,,	,,	
24	102	102·8	,,	,,	
25	101·4	102	,,	,,	
26	102·8	103·4	Scanty	,,	
27	101·8	102·4	Absent	,,	
28	101·8	102·2	Fairly numerous	,,	Animal feeding and looking well.
29	Nor	mal	—	—	
66	Nor	mal	Scanty	—	Animal well.

Recovered.

Summary of Experiment No. 1.

In this experiment four susceptible adult cattle were used. They each had the same quantity of blood, viz., 50 c.c., injected, with the exception of No. 21 which had 45 c.c. Three animals, viz., Nos. 21, 22, and 23, were treated with the drug trypanred. One, No. 20, remained untreated as a control.

The disease resulting from the inoculation was in each case very severe. Two of the animals treated, viz., Nos. 21 and 23 died, as also did the control animal.

In No. 21 2 grm. of trypanred was injected on the twelfth day

after inoculation, and soon after clinical symptoms had become established.

The drug appeared to have an effect in reducing the number of parasites in the blood, and to some extent in lowering the temperature. It did not, however, have any lasting effect in staying the course of the disease, the animal dying on the twenty-first day after inoculation from acute piroplasmosis (redwater).

TABLE III.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
5	101·8	101·8	Absent	Normal	
6	102	103·4	,,	,,	
7	102·6	102·8	,,	,,	
8	105·2	106·8	Numerous	,,	Animal ill; fæces blood-stained; not feeding.
9	10 a.m. 106·4	--	,,	,,	11 a.m., injected intravenously 1 grm. trypanred in 50 c.c. water.
,,	—	1 p.m. 108	—	,,	Pulse rapid and weak; not feeding.
,,	—	5 p.m. 105·4	—	,,	Fæces dysenteric; discharge from notrils.
,,	—	8 p.m. 102·8	—	—	
10	106·6	106·2	Absent	Normal	Mucous membranes congested. 5 p.m., injected subcutaneously 1 grm. trypanred in 100 c.c. water.
11	105·8	107·2	,,	,,	Animal much brighter.
12	106·4	106·6	,,	,,	
13	106·2	106·8	Scanty	—	
14	105·8	105·8	,,	Normal	
15	101·2	102·8	,,	,,	Relapse; extremities cold; pulse weak.
16	96	—	—	—	Semi-conscious; otherwise as before.

Died noon on sixteenth day after inoculation.

In cow No. 22, 2 grm. of trypanred were injected intravenously on the twelfth day after inoculation. There had been a fairly high temperature for a few days previously, but otherwise there were very few signs shown by which the stock-owner would know that his animal was ill, the appetite also remaining good. On the day of injection of the drug, however, the cow was manifestly very ill. On the day following the use of the drug the parasites had disappeared from the peripheral blood. There, however, did not appear to be any great effect upon the temperature which gradually reached the normal on the seventeenth day. There was a slight relapse on the twenty-eighth day when parasites were fairly numerous. Parasites again appeared on the sixty-sixth day after inoculation, but the animal remained well.

With cow No. 23 the drug was injected, viz., .1 grm. intravenously, at 11 a.m., on the day following the onset of symptoms and the appearance of parasites. There was in this case a marked and immediate effect upon the temperature which commenced to fall two

hours afterwards, the temperature at 1 p.m. being 108° F., and at 8 p.m. it had fallen to 102·8° F. At 9 a.m. the following morning, however, it had again risen to 106·6° F. At 5 p.m. the same day 1 grm. of trypanred was injected subcutaneously, but this time no effect in lowering the temperature was produced. The parasites, which were numerous on the morning of the first injection, had disappeared on the next day, the tenth, but they reappeared on the thirteenth day, and persisted until death took place on the sixteenth.

TABLE IV.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
8	102	102·2	Fairly numerous	—	
9	102·6	103·4	Numerous	—	
10	105·4	105·4	Absent	—	
11	105·2	106·4	Scanty	Marked red-water (hæmoglobinuria)	
12	105·8	106·2	Absent	Slight do.	
13	105·4	106·4	,,	Normal	Animal looking very ill.
14	105·2	105·6	,,	—	Fæces dysenteric.
15	104·2	105·2	,,	—	
16	104·8	104·4	,,	—	
17	104	104·4	,,	—	
18	104·6	105·2	,,	—	
19	102·6	103	,,	—	
20	104·6	104·2	,,	—	
21	102·4	102·8	,,	—	
22	102·6	104·6	,,	—	
23	103	101·6	,,	—	
24	101·8	101·8	,,	—	
25	102	104·2	,,	—	
26	104·2	103·8	,,	—	
27	103·4	102·8	,,	—	Cow lying down, but does not seem seriously ill. Feeding fairly well.
28	102·6	102·8	Very numerous	—	
29	104·4	104	Fairly numerous	—	Not so well.
30	101·8	—	Very numerous	—	

Died noon on thirtieth day after inoculation.

In this case the drug appeared to have an effect upon the parasites, but not a permanent one. It also had a marked effect upon the temperature soon after injection, but this was only transitory, a subsequent injection the next day had no effect at all. There was also some slight improvement in the animal's condition soon after the use of the drug, but this again was only temporary.

The control cow, No. 20, lived longer than two of the treated animals, viz., thirty days after inoculation, it finally dying from chronic piroplasmosis (redwater).

Conclusions.—Whilst the injection of trypanred appears to have

some effect in destroying the parasites in the blood of an animal affected with redwater, its effect in reducing the temperature in severe cases is uncertain. The effect of the drug in arresting the course of the disease in severe cases is slight, even when animals are treated early. It would, therefore, appear that the use of the drug trypanred has not been attended with such results as would justify its further use in the field.

Experiment No. 2, with Trypanblue.

In this experiment highly virulent blood was used taken from cow No. 28, which died a few days later from redwater. The disease in No. 28 was communicated by larval ticks, the progeny of some adult ticks taken from a natural and fatal case of redwater at Geraldton, North Queensland.

Table V.

Days after Inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
1	101·4	102·8	Absent	Normal	
2	103	105·8	,,	,,	Animal looking dull.
3	105·8	106·6	,,	,,	
4	102·2	102	,,	,,	
5	107·2	105·8	Scanty	,,	Cow ill; not feeding well.
6	106·4	105·8	,,	,,	,, ,,
7	106·2	106·2	,,	,,	,, ,,
8	106·6	107	,,	,,	Cow worse; not feeding; fæces blood-stained.
9	106·2	105·8	,,	,,	1 p.m., injected intravenously 1 grm. trypanblue in 100 c.c. water.
10	105·4	106	Absent	,,	Feeding a little.
11	104·4	105·4	,,	,,	Still improving.
12	103·2	103·8	,,	,,	Brighter.
13	102	102·2	,,	,,	Progressing favourably.
14	Nor	mal	,,	,,	Feeding well, but very weak.

Recovered.

In this experiment the use of trypanblue was not commenced until the disease had become well established in the animal, in order to ascertain what effect the drug had at this stage, as in practice with the majority of animals naturally contracting redwater in this State, the disease would, when taken in hand for treatment, be well advanced. This experiment would, therefore, more nearly approach the conditions met with in the field.

Cow No. 29, *aged.* (*Treated.*) *February* 2, 1910.—Inoculated subcutaneously with 60 c.c. blood from cow No. 28. (See Table V.)

Parasites were never numerously present, but the anæmia resulting from the disease was fairly severe. Blood lesions, viz., poikilocytosis, polychromatophilia, punctate basophilia, &c., appearing on the thirteenth day. The blood-count fell to 4,000,000 per c.mm.

Cow No. 30, *aged.* (*Treated.*) *February* 2, 1910.—Inoculated subcutaneously with 60 c.c. blood from cow No. 28.

TABLE VI.

Days after Inoculation	Temperature a.m. °	Temperature p.m. °	Parasites	Urine	Remarks
1	101·6	101·8	Absent	Normal	
2	101·8	104·6	,,	,,	
3	106	106·2	,,	,,	
4	105·4	106·6	,,	,,	Dull.
5	107·2	107	,,	,,	Looking and feeding fairly well.
6	107·2	106·4	,,	,,	,, ,,
7	106·6	107	Scanty	,,	Beginning to look ill; not feed-well; difficulty in passing urine.
8	106·4	107·2	Absent	,,	Not feeding; signs of enteritis; general symptoms of piroplasmosis.
9	106·4	106·2	Scanty	,,	1 p.m., injected intravenously 1 grm. trypanblue in 100 c.c. water.
10	106	105·8	,,	,,	Feeding a little; pulse rapid and weak.
11	105·2	105·6	—	—	
12	105·2	104·6	—	—	Looking brighter and feeding better.
13	101·8	102·2	—	—	Still improving.
14	Normal		—	—	Feeding and looking well; very weak, however.

Recovered.

TABLE VII.

Days after inoculation	Temperature a.m. °	Temperature p.m. °	Parasites	Urine	Remarks
1	101·8	102·2	Absent	Normal	
2	103·8	105·2	,,	,,	
3	106·2	105·8	,,	,,	Dull.
4	104·8	105	,,	,,	
5	105	106·2	,,	,,	Not feeding very well.
6	106·4	106·6	,,	,,	
7	105·4	104·2	Scanty	,,	Commencing to look ill. Respiration laboured. Not feeding.
8	105·6	106	Fairly numerous	,,	Very ill.
9	106·4	106·8	Numerous	,,	1 p.m., 1 grm. trypanblue in 100 c.c. water injected intravenously.
10	106·4	104·6	Very numerous indeed	—	Not feeding, but looks a little better. Pulse stronger.
11	101·4	—	—	—	9 a.m., comatose and breathing stertorously.

Died noon eleventh day after inoculation.

The reaction began on the third day after inoculation, but parasites did not appear until the seventh day. Trypanblue was injected on ninth day. (See Table VI.)

In this case, as in No. 29, parasites were scanty. Very marked

blood changes appeared on the thirteenth and lasted until the twenty-second day. Only a few blood-counts were made in this case.

On the twenty-second day an abscess appeared at the site of inoculation, but this rapidly responded to the usual treatment.

Cow No. 32, *aged.* (*Treated.*) *February* 2, 1910.—Inoculated subcutaneously with 60 c.c. blood from cow No. 28. Temperature reaction began two days after inoculation, but parasites were not observed until the seventh day. Trypanblue was injected on the ninth, and death occurred on the eleventh day. (See Table VII.)

TABLE VIII.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
1	102	102·2	Absent	Normal	
2	101·6	102·6	,,	,,	
3	104·6	105·2	,,	—	
4	103	105·8	,,	—	
5	106·8	106·6	,,	-	Dull.
6	106·8	106·8	,,	—	
7	105·8	106·4	,,	—	
8	106·2	105	Scanty	—	Not feeding.
9	106·6	106·2	,,	—	Very ill; pulse weak and thready.
10	105·2	106	Fairly numerous	—	,, ,, ,,
11	105	103·2	Numerous	—	Animal moribund.

Died at 5 p.m. on the eleventh day after inoculation.

TABLE IX.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	° a.m.	° p.m.			
1	101·6	101·8	Not seen	Normal	
2	103·6	105·8	,,	,,	
3	104·8	106·4	,,	,,	
4	104·2	105·6	,,	,,	
5	107·6	107·4	Scanty	,,	Dull.
6	106·2	106	Not seen	,,	Fæces dysenteric.
7	104·6	104·2	,,	,,	
8	106·2	105·8	Scanty	,,	Mucous membranes congested; not feeding.
9	107	104·4	,,	,,	Breathing laboured.
10	103·8	103	Fairly numerous	,,	Aborted; cow very ill indeed; pulse very weak and rapid; breathing laboured: mucous membranes blanched.

Died ten days after inoculation.

Post-mortem examination revealed typical signs of acute piroplasmosis (redwater). Although no hæmoglobinuria (redwater) was observed during life, the urinary bladder was found to be full of claret-coloured urine.

Cow No. 31, *aged.* (*Untreated.*) *Control. February* 2, 1910.—Inoculated

subcutaneously with 60 c.c. blood from cow No. 28. Temperature reaction began on the evening of the second day after inoculation, but parasites were not found until the eighth day, death occurring on the evening of the eleventh day. (See Table VIII.)

Post-mortem examination showed extensive signs of acute piroplasmosis (redwater). Here, again, although no redwater was observed to be passed during life, the urinary bladder was found to contain about a quart of bright red urine.

Cow No. 33, *aged.* (*Untreated.*) *Control. February* 2, 1910.—Inoculated subcutaneously with 60 c.c. blood from cow No. 28. Temperature reaction began on the second day after inoculation, and parasites appeared on the fifth day, the animal dying on the night of the tenth day after inoculation. (See Table IX.)

Post-mortem examination showed characteristic features of acute piroplasmosis (redwater). No redwater was seen to be passed during life, but the urinary bladder was found distended with dark red urine.

Summary of Experiment No. 2.

In this experiment five adult susceptible cows were used. Three, viz., Nos. 29, 30, and 32, were treated with trypanblue; and two, viz., Nos. 31 and 33, remained untreated as controls.

Of the three cows treated with the drug, one died; both of the control animals died also.

The reaction following the injection of blood from cow No. 28 was very severe indeed, as it was intended to be. In addition to this, treatment was not commenced as soon as the animals showed manifest signs of illness, but was purposely delayed until the disease had become well established, because this would be the stage in which treatment would be most frequently begun on a farm. It will be noted that in this experiment, in every case the temperature began to rise very early—on the second or third day after inoculation. Parasites, however, were not seen until between the fifth and eighth days.

With cow No. 29, temperature reaction began on the evening of the second day, and parasites were seen on the fifth day after inoculation. During the reaction the animal became very seriously ill. Trypanblue was not used until the fourth day after the parasites had appeared, and the day following the appearance of very marked symptoms.

The parasites had entirely disappeared on the day following the injection of the drug, and the animal appeared to be a little improved. The temperature did not fall immediately after the use of the drug, but reached the normal about four days later. The drop, however, was steady and continuous.

With cow No. 30, temperature reaction began on the evening of the second day after inoculation. Parasites appeared on the seventh day, and trypanblue was injected two days after they were first seen. Marked symptoms had been existing for two days previously. In this case the parasites did not disappear at once, but were seen on the following day, but not afterwards.

There was, however, a manifest improvement in the animal's condition on the day following the injection. Here, again, there was apparently no immediate effect upon the temperature, which remained

about the same until three days after injection (the thirteenth after inoculation), when it suddenly dropped to normal and remained so.

In cow No. 32 also, the temperature reaction began on the second day after inoculation, but parasites were not seen until the seventh day. The animal did not commence to look very ill until the same day. Trypanblue was injected on the ninth day, two days later. In this case, contrary to the two preceding ones, the drug apparently had no influence whatever upon the parasites the following day, although, perhaps, such might have been seen had the animal survived long enough.

There was a rapid and decided fall in the temperature on the day following the administration of the drug, but this was evidence of general collapse rather than signs of cure, the animal dying within forty-eight hours after injection of trypanblue, and on the eleventh day after inoculation.

The *post-mortem* examination showed severe enteritis and endocarditis. The two untreated (control cows) had very severe reactions, and died on the eleventh and tenth days after inoculation respectively, of acute piroplasmosis (redwater).

Conclusions.—The use of trypanblue in the foregoing cases had a decidedly beneficial action on the course of the disease in the cases treated, except No. 32, both directly in destroying the piroplasms in the circulating blood, and also in lowering the body temperature. It is very evident, however, that for the full benefit of the drug to be realized, it must be used as early as possible.

When the disease (redwater) has become fully established, even then the injection of trypanblue will no doubt exert its specific action in destroying the parasites in the circulation, but by this time other and grave changes have taken place in various organs of the body, the animal dying from the effects of the latter complications, which the drug is powerless to control.

Experiment No. 3, with Trypanblue.

The subjects of this experiment, three in number, were valuable pure-bred Devon bulls, Nos. 34, 35, and 37. They had recently been imported from England and were inoculated at the Experimental Station in order to render them immune against piroplasmosis (redwater) before exposing them to natural infection. Each animal was inoculated with blood from two different animals on two occasions, but no redwater reaction due to *Piroplasma bigeminum* resulted. They, however, all became infected with the ring and rod piroplasm.

On the third occasion they were each inoculated with 5 c.c. blood from heifer No. 18. This blood had previously been ascertained to be very virulent indeed, *vide* experiment No. 1 with trypanred. Naturally under the circumstances it was out of the question to leave one of the bulls untreated as a control. The details of the experiment are as follows:—

Bull No. 34.—Inoculated subcutaneously February 28, 1910, with 5 c.c. blood from heifer No. 18. Parasites (*P. bigeminum*) appeared on the eleventh day, but temperature reaction did not begin until twelve days after inoculation. Trypanblue was injected on the fourteenth day. (See Table X.)

There was much destruction of red corpuscles in this case with

marked poikilocytosis, polychromatophilia, and punctate basophilia, the latter changes lasting a fortnight after return of temperature to normal.

TABLE X.

Days after inoculation	Temperature ° a.m.	Temperature ° p.m.	Parasites	Urine	Remarks
11	101·8	102·2	Scanty	—	Dull.
12	102·8	103·8	Numerous	—	Not feeding well.
13	104·2	104·8	,,	—	Ill; not feeding; mucous membranes congested.
14	106	106	Very numerous	Slightly redwater	Seriously ill; pulse weak and rapid; breathing hurried and laboured; not feeding. 1 p.m., injected subcutaneously 1 grm. trypanblue in 100 c.c. sterile water.
15	102·6	102·4	Absent	Normal	Feeding and ruminating; looking better.
16	102·2	102·2	,,	—	Still improving; mucous membranes very pale.
17	Nor	mal	,,	—	Progressing favourably.

Recovered.

TABLE XI.

Days after inoculation	Temperature ° a.m.	Temperature ° p.m.	Parasites	Urine	Remarks
1	101·8	102·4	Not seen	—	
2	101·8	103·8	,,	—	
3	105·4	105·8	,,	—	No signs of illness except temperature.
4	106·4	106·8	,,	—	,, ,,
5	105·8	106·4	Only one pair seen	—	,, ,,
6	104·2	103	Not seen	—	,, ,,
7-13	Nor	mal	,,	—	,, ,,
14	102·4	104	Fairly numerous	—	Dull; not feeding well.
15	105	106·4	Very numerous indeed	Redwater severe	Not feeding; very ill; pulse very rapid and irregular. 3 p.m., 1 grm. trypanblue injected subcutaneously.
16	103	104·4	Rather scanty and degenerating	Less severe	Brighter; feeding a little; diarrhœa marked however.
17	104·2	104·2	Not seen	Normal	Not so well; jaundice marked.
18	104·2	104·8	,,	,,	
19	102	102·2	,,	—	Appetite little; rather dull.
20	Nor	mal	,,	—	Improving.
31	101·8	102	Very scanty indeed	—	Quite well.

Bull No. 35.—Inoculated February 28, 1910, with 5 c.c. blood from heifer No. 18. A temperature rise occurred on the second day after

inoculation and lasted five days. Thence until the fourteenth day the temperature remained normal. The real reaction began on the latter day. Parasites were first seen on the fifth day and not again until the fourteenth day. Trypanblue was injected on the fifteenth day. (See Table XI.)

In this case icterus was a feature besides the hæmoglobinuria. Blood destruction was marked. On the thirty-first day after inoculation parasites were again seen, but only for one day.

Bull No. 37.—Inoculated February 28, 1910, with 5 c.c. blood from heifer No. 18. Parasites (*P. bigeminum*) were first observed on the eleventh day after inoculation, and temperature reaction began on the twelfth. Trypanblue was injected on the fourteenth day. (See Table XII.)

TABLE XII.

Days after inoculation	Temperature		Parasites	Urine	Remarks
	°	°			
	a.m.	p.m.			
10	102	102·8	Absent	—	
11	100·6	101·8	Scanty	—	
12	103	103·8	Fairly numerous	—	
13	104·4	105	,,	—	Dull; not feeding well.
14	106	107·8	Very numerous	Redwater severe	Very ill: pulse rapid, weak and thready; not feeding. Mucous membranes congested. 1 p.m., injected 1 grm. trypanblue subcutaneously
15	104·4	105	Absent	,,	Pulse stronger; mucous membrane blanched.
16	103·8	104·6	,,	Redwater much less	Not feeding well, but brighter.
17	103·2	103	,,	Urine clear	Still improving; feeding better.
18	102·6	103	,,	,,	
19	102·4	102	,,	,,	Feeding and looking well.
20	Nor	mal	,,	,,	Recovered.

Blood lesions, viz., poikilocytosis, polychromatophilia, and punctate basophilia became evident on the sixteenth day after inoculation, and increased in severity until the twentieth day. They then gradually decreased.

Summary of Experiment No. 3.

In this, three animals, viz., Nos. 34, 35, and 37, were used. As before stated, these animals were not inoculated merely for the purpose of testing the efficacy of trypanblue, but for the purpose of immunizing them preparatory to going to North Queensland, where redwater is very virulent.

No animals could be used as controls in this experiment, as they were too valuable. However, the three were very seriously ill before the drug was used, and I had grave doubts as to the recovery of two of them.

With No. 34, parasites made their appearance on the eleventh day

after inoculation, and the temperature reaction began on the evening of the twelfth day. It was intended to adopt ordinary treatment should any of these bulls become ill, but in this case the symptoms became so urgent and grave on the fourteenth day that it was decided to inject trypanblue. This was done at 1 p.m. The result was very gratifying. On the following day the temperature had fallen to normal, the parasites had disappeared, and the animal was already looking better. Recovery was uninterrupted.

Bull No. 35.—Temperature reaction, irregular in this case, set in on the evening of the second day after inoculation, but fell to normal on the seventh day, only one parasite being seen during that time. On the eleventh day the temperature began to rise again, parasites appearing at the same time. The animal became suddenly and seriously ill, parasites being numerous, with the result that trypanblue was injected at 3 p.m. on the fifteenth day. The result, although not so rapid as in bull No. 34, was very evident. On the following day the parasites were scantily present, and on the day after that (the seventeenth) they had quite disappeared. They reappeared on the thirty-first day after inoculation, but there was no apparent effect upon the animal's health.

In this case also there was a rapid and marked reduction in temperature following the injection of the drug, but it rose again soon after, and did not fall to normal until the nineteenth day. There was, however, steady improvement in the animal's health from the day following the injection.

Bull No. 37.—Temperature reaction began on the twelfth day, and parasites were first seen on the eleventh day after inoculation. On the fourteenth day the animal became dangerously ill, parasites being very numerous. Trypanblue was therefore injected at 1 p.m. the same day. On this occasion also the result following the use of the drug was very marked. Parasites had quite disappeared on the following day, and the temperature had dropped from 107·8° to 104·2° F. On the nineteenth day (five days after the injection) it had reached normal, the fall being steady and continuous.

Improvement in health was not seen so rapidly as in the other cases, no doubt because the animal had the most severe attack, but two days after the use of the drug he looked brighter, and commenced to feed on the third day. Recovery was then steady and uninterrupted.

Conclusions.—The use of trypanblue in these cases had a decidedly rapid and beneficial effect, improvement taking place very soon after its administration. Temperature was rapidly lowered, and the parasites in the peripheral circulation destroyed. It therefore follows, one may reasonably conclude, that the use of trypanblue is likely to be followed with good results when the drug is injected as soon as the disease becomes manifest.

Experiment No. 4.

In this experiment seven adult cows were used, Nos. 38 to 44 inclusive. They were obtained from the Darling Downs, which is quite free from ticks, and were said never to have been in tick-infested country.

On February 24, 1910, each cow was inoculated subcutaneously with 50 c.c. citrated blood from heifer No. 18. This blood was very virulent, as will be seen from experiments Nos. 1 and 3.

Cow No. 38.—Parasites appeared on the eighth day. There was a slight temperature reaction, but not severe enough to warrant the use of trypanblue. The animal made a good recovery.

Cow No. 39.—Temperature reaction began on the eighth day after inoculation, parasites appearing on the same day. For several days the animal was fairly ill, but here again the case was not considered a good one for the administration of trypanblue. The cow made an uneventful recovery.

Cow No. 40.—Parasites appeared on the eighth day after inoculation. The animal showed very little indisposition as the result of the inoculation, and there was very little temperature reaction. Trypanblue was therefore not used. A good recovery was made.

Cow No. 41.—Parasites appeared on the eighth day after inoculation. As with No. 40, there was no temperature reaction, and very slight indisposition. Trypanblue was not used. A good recovery was made.

Cow No. 42.—In this case there was a distinct temperature reaction, commencing on the sixth day after inoculation. Parasites were first seen on the seventh day. The animal became ill, but as the appearances showed that the case would not be a severe one, trypanblue was not used. A good recovery was made.

Cow No. 43.—Parasites appeared on the ninth day after inoculation, but temperature reaction did not set in until the fifteenth day. For a few days after this the animal became ill, but here again not sufficiently so to justify the use of trypanblue in an experiment of this nature. The animal recovered without its aid.

Cow No. 44.—Parasites first appeared on the eighth day. Temperature reaction was not very marked, and the cow did not appear very ill. Trypanblue was not used. The animal made a good recovery.

Experiment No. 5.

In this experiment eight adult cows, Nos. 46 to 53 inclusive, were used. As with the cows in the previous experiment they were obtained from the Darling Downs. In this case, however, as there were good grounds for believing that the previously obtained cows had some degree of acquired immunity, the stock inspector who made the purchase was asked to take extra precautions in making certain that this last batch of cows had never in their life been in tick-infested country.

On March 24, 1910, each cow was inoculated with 50 c.c. citrated blood from heifer No. 18. The reactions which followed were so slight that they were each reinoculated on April 6, with 50 c.c. blood from steer "S," an animal whose blood was known to be very virulent. Again the ensuing reaction was unsatisfactory, and on April 18 each animal was inoculated a third time, on this occasion with 50 c.c. blood from steer "D," also an animal whose blood was known to be virulent. The reaction on this occasion was quite negative.

In all these eight cases the reactions were of such a character that, considering the object of the experiments was to ascertain what curative effect trypanblue had upon cases of piroplasmosis (redwater), the use of the drug was not considered justified. It was therefore

not used in any of the above eight cases. All the animals made a complete, unaided recovery; no treatment of any herd being adopted.

Cow No. 46.—Temperature reaction began on the thirteenth day after inoculation. Parasites appeared on the nineteenth day; illness was not very marked. Recovery complete.

Cow No. 47.—Temperature reaction began on the eleventh day after inoculation. Parasites appeared on the fifteenth day. The cow appeared ill for several days, but a good recovery was made.

Cow No. 48.—Parasites were seen on the eleventh day after inoculation, and temperature reaction began on the same day. Illness was fairly severe, but under the circumstances, as before stated, not sufficiently to justify the use of trypanblue. An uneventful recovery was made.

Cow No. 49.—Temperature reaction began on the twelfth day, and parasites appeared on the thirteenth day after inoculation. Illness was slight, and recovery soon took place.

Cow No. 50.—Temperature reaction began on the ninth day after inoculation. Parasites (*P. bigeminum*) could not be seen at any time, but the other species of piroplasm (viz., rings and rods) first made their appearance on the ninth day. There were little visible signs of illness.

Cow No. 51.—Parasites appeared on the eleventh day, and temperature reaction began on the thirteenth day after inoculation. Illness was fairly marked, but trypanblue was not used. A complete recovery was made.

Cow No. 52.—Temperature reaction began on the ninth day, and parasites were first seen on the thirteenth day after inoculation. In this case the illness was severe, but as it had been chosen as a control the animal was not treated with the drug, recovering completely without its aid.

Cow No. 53.—Temperature reaction began on the twelfth day. The only day on which parasites were found was the sixteenth after inoculation. Illness was not very marked, and recovery rapid and complete.

Summary of Experiments, Nos. 4 and 5.

For convenience these two separate experiments are considered here together. In the first, seven adult presumedly susceptible cows were used, and in the second, eight adult presumedly susceptible cows.

In experiment No. 4 the seven cows were inoculated once, each having 50 c.c. blood from heifer No. 18. This blood had been proved on various occasions to be highly virulent (also *vide* experiments Nos. 1 and 3). All of the animals reacted, parasites appearing in the blood in the usual course, and the clinical symptoms were more or less evident. Although in several instances the reaction was fairly severe, all of the animals recovered without the aid of any treatment whatever.

In experiment No. 5 the eight cows were each first inoculated with 50 c.c. blood from heifer No. 18. Thirteen days after they were each reinoculated with 50 c.c. blood from another animal whose blood was known to be virulent. Twelve days after the second

inoculation they were injected a third time with 50 c.c. virulent blood from a third animal. In this experiment, as with the preceding, the result from the point in view was unsatisfactory. All of the animals reacted it is true, and in the blood of all except one, viz., No. 50, parasites (*P. bigeminum*) could be found, but, considering the object of the experiments, the illness resulting, although in some cases fairly severe, was not considered of such a nature as would justify the use of the drug trypanblue. All of the animals made a good rerovery without its aid.

Conclusions.—Although the two experiments just cited have no direct bearing upon the question as to the efficacy of the drug trypanblue, it has an indirect bearing of some importance, as they illustrate the remarks made at the commencement of this report, that were the drug used indiscriminately upon all experimental cases like these, the conclusions likely to be drawn would be apt to be erroneous. For in these cases just quoted, had the drug been used even only upon those animals which were manifestly ill and showing parasites in their blood, the cure would have been credited to trypanblue, whereas it is seen that all fifteen animals recovered without it. The experiments show the great necessity for care in drawing conclusions from a few experimental cases.

I have not attempted to go into the reasons why fifteen adult cows brought from a tick-free area should all fail to become severely infected when blood of such high virulency was used, as a discussion on this subject would open up too many side issues, apart from the cure of redwater to which this article is confined.

General Conclusions.

Trypanblue in cases of redwater or tick fever (piroplasmosis) has been shown in the main to be an efficient remedy. The most favourable results following its use, however, are seen when it is injected at an early stage of the disease. It may also be used with the anticipation of good results following when the fever is at its height, but if the disease has been in existence several days, not counting the period of inoculation—that is, the animal has been actually ill for some days—favourable results must not be looked forward to with too much confidence, for although, even in these cases, the drug exerts an undoubted effect upon the parasite, complications may have already set it, and when such is the case it is the latter which may ultimately cause the death of the animal. Although the results following the use of the drug in experimental cases have been very satisfactory, yet definite conclusions can only be drawn after the drug has been used for some time in the field on a large scale and over a large area. The conditions under which experiments of this kind are performed in a laboratory are to a great extent, and of a necessity, somewhat artificial, although such preliminary experimental work is essential. What one desires is that the same results as obtained by experiment shall follow when natural conditions obtain, the latter being the final test.

The Use of Drug Treatment in Practice.

The answer to the question as to what benefit the successful treatment of redwater will be to stock-owners in Queensland depends upon what aspect the matter is viewed from.

With the large cattle stations extending over hundreds of miles, and also even upon some of the smaller grazing farms, curative treatment is not practicable, for the cattle wander over large areas, and even if the owner wished, he would seldom see the animals early enought for curative treatment to be of any use. The means best suited for such conditions are preventive ones—either the eradication of the tick or preventive inoculation, the latter measure apparently finding most favour with the station owner at present.

It is with the dairy farmer and the owner of a few head of cattle that the curative treatment is likely to be of greatest practical benefit, and also with the station owner with regard to his stud bulls. The loss experienced when valuable susceptible bulls are introduced to infected country is sometimes heavy. As such animals are watched pretty closely, the possibility of a cure being at hand would be of great practical benefit, for the drug could be used without delay.

Concerning the dairy farmer, the problem here is not altogether a simple one, for on the larger farms the dry cows are turned out and only seen at irregular intervals. On the smaller farms, of course, the question is simpler.

However, generally speaking, on all of the dairy farms the milking cows are seen daily, and the owner can generally tell when an attack of fever is setting in, even if the animal is not actually passing redwater. These are the cases where treatment is very practicable and likely to be of the greatest benefit, and, considering the large number of dairy cattle lost annually in Queensland through tick fever or redwater, the farmers concerned should certainly be persuaded to adopt the use of trypanblue as a cure, especially those who are opposed to the practice of preventive inoculation.

Since writing the foregoing article I have had occasion to use trypanblue upon a number of naturally occurring cases of redwater on dairy farms in the neighbourhood of Brisbane, the cases being of a very severe type and the previous mortality heavy.

The results following the use of the drug in practice have so far borne out what was observed experimentally. Without going into details here, one may briefly say that, providing the disease has not been in progress too long, one has every reason to anticipate a favourable result following the administration of trypanblue; but where complications have set in, which often happens here if the disease has taken a long course, one must not place too much reliance upon the efficacy of trypanblue, but also treat the complications as th arise.

Clinical Articles.

BACELLI'S TREATMENT OF TETANUS BY HYPODERMIC INJECTIONS OF A SOLUTION OF CARBOLIC ACID.

By Lieutenant-Colonel J. MOORE.
Deputy Principal Veterinary Officer in India.

In Winslow's "Veterinary Materia Medica and Therapeutics," fifth edition, it is recorded that "Bacelli's treatment of tetanus has met with remarkable (fourth edition says considerable) success of late. One drachm of the pure acid in solution (5 to 10 per cent.) should be injected in the region of the neck and shoulders of the horse every two hours during the first thirty-two hours, and less frequently afterwards. As much as 36 dr. may be given to the horse in twenty-four hours, for there appears to be a special tolerance for carbolic acid acquired in tetanus."

Instructions were given to veterinary officers serving in India to try Bacelli's treatment, and the following communications may be of interest to readers of your Journal:—

(*Communicated by Lieutenant H. C. Stewart, A.V.C., Station Veterinary Hospital, Nowshera.*)

A horse belonging to the 35th Scinde Horse, Peshawar, was admitted to the 21st Cavalry Veterinary Hospital, Nowshera Cavalry Cantonment, on September 19, and was treated as follows:—

A purgative was first given, and after twenty-four hours pure carbolic acid, 1 dr. in solution, was injected into the region of the neck and shoulders every two hours for thirty-two hours; then every four hours for three days, and afterwards every eight hours. This treatment was continued until the 26th inst., on which date I inspected the horse. He was then in a very serious condition, showing the worst symptoms of the disease, the stiff or "stag-like" appearance of the extremities, and nearly jumping out of the box on the slightest movement of anyone in the vicinity. No length of time being stated for this treatment, and the horse apparently becoming worse, I decided to try a change of treatment for two or three days, and alternate it with the carbolic acid method. Consequently 1 dr. ext. belladonna virid. in treacle was administered twice daily with quinine. Under this treatment the animal at once started to improve, and it was therefore continued until October 10. It had now practically recovered,

and tonic powders containing pulv. nux. vom. 1 dr., pulv. gentian 2 dr., pulv. zingib. ½ oz., were given daily. The horse was discharged as cured on October 15, having apparently quite recovered.

Will you please ascertain how long Bacelli's treatment should be continued, as if there is no danger of carbolic acid poisoning I propose next time to continue the treatment until the case is cured, or dies. Under the circumstances, I cannot say if the carbolic acid or belladonna effected the cure, but am inclined to think that both these drugs had a share in it, the carbolic acid tiding it over the worst stages of the disease.

(*Communicated by Lieutenant R. W. Mellard, A.V.C., Station Veterinary Hospital, Mhow.*)

On December 23, 1909, a bay Australian mare, "D" 2nd Inniskilling Dragoons, aged 11, an officer's charger, was admitted to hospital with wound contused (broken knees), both fore. The accident was a severe one, extending down to the tendon sheath. The mare was detained in hospital, the wounds healing very slowly. On the morning of February 2, when going round the hospital, I observed the mare's tail erected, which looked very suspicious of tetanus. I had the mare taken outside, and on examination there was no doubt the case was one of tetanus.

Symptoms.—The jaws were fixed, protrusion of the nose, contraction of the muscles of the neck, ribs, and along the back; when the head was elevated the membrana nictitans passed over the eye; on the slightest noise there were tetanic convulsions.

Treatment.—The animal was isolated in a shed, which was closed in and kept in semi-darkness. An aloetic ball was given at once.

Diet.—Lucerne and very sloppy bran mashes.

Bacelli's Treatment.—First day, every two hours the following injections were given hypodermically: Ac. carbol. 1 dr., aq. dist. 10 dr.

Second day, same injection every three hours.

Third day, same injection every four hours.

Fourth day, no injection given.

Fifth day, seven injections given every third hour.

In all the animal had 3 oz. 7 dr. I stopped the injection, as I found the insertion of the needle into the skin caused the animal to have violent convulsions. Even touching the skin caused great pain, but as soon as a few drops of the concentrated carbolic solution was injected, it acting as a local anæsthetic, the animal did not mind further handling over the seat of inoculation. Combined with Bacelli's

treatment, large doses of chloral hydrate 1½ oz. were given *per rectum* daily for four days. Also pot. bromide ½ oz. was given on the fifth day, and continued for ten days. Since then no medicine has been given; the animal is still isolated, and is improving slowly. She has now been under treatment twenty-six days.

(*Communicated by Colonel F. W. Forsdyke, A.V.S., S.V.O., Second* (*Rawal Pindi*) *Division.*)

Bacelli's treatment of tetanus with carbolic acid has been tried at Rawal Pindi and Campbellpore, and to date with little success.

CASE 1.—The first case was Horse No. 49, 13th Battery, R.F.A., admitted to hospital at noon, showing marked symptoms of tetanus, probably due to wound infection, a nearly healed wound existing on the abdomen. Bacelli's treatment was commenced, 1 dr. of a 10 per cent. solution of pure carbolic acid being injected in the region of the neck and shoulders every two hours on that day. The condition of horse showed no change. Thin gruel was administered and swallowed with difficulty.

Second day, the injections were continued up to 8.30 p.m. Condition remained unchanged.

Third day, at 12·30 a.m. another injection was given and repeated every four hours until 8.30 a.m., then every two hours until 8.30 p.m. Result: distress and excitement shown.

Fourth day, at 12.30 a.m. injections were given every four hours until 8.30 a.m., and every two hours until 6 p.m., when the patient became worse, showing signs of approaching death. Died at 9 p.m.

CASE 2.—A private charger, admitted to hospital late at night, and received a dose at once of anti-tetanic serum. The next morning was found to be doing well, and attempting to eat. At 9 a.m. Bacelli's treatment was commenced and carried on until 5 p.m., when the tetanic spasms became so severe that the animal could not be approached without danger of its falling. He had received up to this time five doses of pure carbolic acid in 7½ per cent. solution. On the following morning the case was considered hopeless, and destruction followed. The veterinary officer in charge records his opinion that "had it not been for Bacelli's treatment he might have recovered."

I am of opinion neither of these cases can be considered conclusive, and am seeking further trials and reports.

ACUTE RHEUMATISM TREATED WITH ASPIRIN INTERNALLY AND ANTIPHLOGISTINE EXTERNALLY.

By MAXWELL EDGAR, M.R.C.V.S.
Wanganui, New Zealand.

The three-year-old thoroughbred colt Polymorpheus in training became suddenly lame on the near foreleg while at walking exercise. This lameness was so severe the lad dismounted, and had some difficulty in reaching the stable. This severe condition soon passed away, but the colt remained sore, the lameness appearing and disappearing in one or more limbs. I was called in four days after the first appearance of the trouble. There was a hot, painful swelling of the near fore fetlock, the near hock was swollen and œdematous, and the temperature 102° F. On the colt being trotted out his action was stiff and cramped, with a slight lameness of the near fore.

Diagnosis.—Acute rheumatism.

Treatment.—He was prepared for physic, and 6 drm. aloes administered. Aspirin 2 drm. was given three times daily in laxative food, and the swollen joints poulticed with antiphlogistine and bandaged with flannel.

The colt recovered within a week and returned to work, and has since won several important races. There has been no recurrence of the trouble since recovery some months ago.

ABORTION IN A MARE, FOLLOWED BY EVERSION OF UTERUS, AND SEPSIS.

By MAXWELL EDGAR, M.R.C.V.S.

A Clydesdade mare, about nine months pregnant, showed signs of abortion. I was called in during the morning on the first appearance of the pains, and founds the forelegs presenting and the head turned towards the left shoulder.

An attempt was made to reduce the head, but the womb violently resisted any interference. Delivery was, however, accomplished with little difficulty by moderate traction. The membranes were entangled in the hind quarters of the fœtus, and delivery being more rapid than anticipated, followed the foal in a mass, and the womb became completely everted.

Morphia 4 gr. was at once given hypodermically. The membranes were stripped as completely as possible, and the womb returned. The

organ was kept in position for half an hour by the arm and fist of an attendant and then was douched with cold water.

I returned at 5 p.m. and found the mare much excited by morphia; no pains, and womb in position.

Next day, 10 a.m., patient dull, no pains, temperature 104° F. I douched the womb with warm water and lysol, and gave hypodermically nuclein and normal salt solution 20 c.c. (Parke, Davis and Co.) twice during the day.

Next morning at 10 a.m. mare brighter and feeding; temperature, 102° F. The discharge from the womb had an evil smell, so I examined womb but failed to find any remains of placenta. Douched again with weak solution of lysol and warm water, and gave instructions to repeat every four hours. Repeated nuclein and salt solution injection.

On returning next morning owner informed me that a small place of placenta came away with the evening douch. Mare quite well, temperature normal, with no stiffness or symptom of lameness.

Nuclein appears in this case to have had some influence over sepsis and reduction of the temperature. I shall give it a further trial.

FRACTURE OF THE OS SUFFRAGINIS IN A RACEHORSE.

By MAXWELL EDGAR, M.R.C.V.S.

A CHESTNUT trotting stallion while doing a preliminary trot attempted to jump a footpath leading over the racing track. He fell and in doing so fractured his near hind pastern.

Examination showed comminuted fracture of the os suffraginis. The pastern and fetlock were bandaged with strong gum plaster, and the horse walked with difficulty to a stable near the course. He was placed in slings, the gum plaster removed, the limb placed in plaster of Paris *secundum artem*. The plaster set well, and from the foot to the hock the limb was completely fixed.

He evidenced much pain for ten days, but fed well. He was taken out of slings at the end of the fifth week, much emaciated, and turned out into a small enclosure. Here he moved about freely, putting some weight on the toe of his foot, but on resting he had to be assisted to rise for about three days.

The plaster was removed at the sixth week, and a light shoe with

a 1½-in. raised bar heel placed on the foot. He now placed much weight on the foot and began to put on flesh. The heel of the shoe was lowered to ¾ in. at the seventh week, and the horse walking sound was returned to owner, with instructions to remove shoe and turn him out to pasture. There was no excessive callus and no deformity of the part, examination of the joint before his departure showing no ankylosis.

It will be interesting to know if the horse will race again.

LIPOMA IN AN AUSTRALIAN COCKATOO ASSOCIATED WITH ENLARGED FATTY LIVER.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.

THE bird, a galah (*Cacatua roseicapilla*, Vieillot), was sent to me by Mr. C. Cummins Cherry, G.M.V.C., Melbourne, with the following history: The case had been brought under Mr. Cherry's notice about six months previously. Suspecting a malignant form of growth, and knowing the danger of operating on birds, he recommended destruction. As the tumour continued to increase in size the owner ultimately agreed to the course recommended, and the animal was killed under anæsthesia. Its age could not be determined.

Situated subcutaneously on the inferior surface of the abdomen, slightly to the right of the median line, was a large oval tumour the size of a mandarin orange. Soft in consistence, it was definitely circumscribed, and was readily separated from the surrounding tissues, which were not infiltrated. On section the tissue proved homogeneous in appearance, being of a yellowish-white colour, except at the posterior border, where there were the remains of an old blood extravasation, which suggested an attempt some time previously at operation. The knife was distinctly greasy, and a scraping examined under the microscope showed the tissue to be extremely fatty in nature.

The viscera were normal, except the liver, which was greatly enlarged, pale, and mottled throughout with irregular greyish areas. On section the tissue was extremely soft and friable, while the knife-blade showed distinctly globules of fat. The other internal organs were normal.

Microscopical examination, as anticipated, showed the tumour to be composed entirely of fat cells. Sections of the liver showed congestion of capillaries, and small areas of blood extravasation. The whole of the hepatic cells were more or less infiltrated with fat, the majority being converted into typical fat cells with peripheral nuclei.

In addition, the interlobular fibrous tissue showed considerable hypertrophy, intercellular bands even penetrating many of the lobules, the great majority of which were indistinguishable as such.

While it is more than probable both the cirrhotic and the fatty states of the liver were simply due to the nature of the food and the prolonged want of exercise to which such tamed animals have to submit, the development of the lipoma subcutaneously cannot be explained on this hypothesis.

Further, the case is interesting as one in which an operation might have been performed with comparatively little of the usual great risk that attends operations on birds.

GASTRITIS DUE TO TRICHOSTRONGYLE INVASION. CASES IN ADULT CATTLE.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.,
Professor of Veterinary Pathology,
AND
GEORGINA SWEET, D.Sc.,
Lecturer in Parasitology at the Melbourne University Veterinary School.

It must be admitted that while gastric derangement, particularly in young cattle and sheep, is frequently due to invasion of the abomasum by numbers of the striped strongyle (*Strongylus contortus*), and that such a condition is readily recognized, the fact that severe digestive disturbances, manifested by diarrhœa and progressive emaciation, may be due to the presence in the fourth stomach, either alone or in conjunction with the former, of large numbers of a very much smaller and with difficulty detected nematode is often overlooked.

During the past, in Australia, records of parasitic invasion have ignored the occurrence of the smaller parasites, partly, no doubt, because the presence of the larger has offered a satisfactory solution for the disease at the time affecting the host, but also, in part, because it has not been recognized amongst the ingesta. In New Zealand, for many years the severe effects of the presence of a small nematode, similar to that described by McFadyean as *S. cervicornis*, and by others as *S. ostertagi*, &c., has been recognized in young cattle, lambs, and even in young goats ("Annual Reports Veterinary Division Department of Agriculture, New Zealand"); but in Australia this occurrence has only recently been recorded, the first observer to do so being Mr. S. Dodd, F.R.C.V.S., in his last annual report to the Queensland Government.

The small nematodes found in the New Zealand cases have been classed among the *Trichostrongylinæ* by Professor Looss, and are probably similar to, if not identical with, those variously described by others as *S. ostertagi*, *S. cervicornis*, &c.

They are found almost confined to the fourth stomach in ruminants, and may be present in enormous numbers. In addition to moving freely amongst the ingesta, numbers are found on the surface of the mucosa, which is generally more or less inflamed, and may even be eroded. Careful examination will generally show small circular elevations, about $\frac{1}{4}$ in. to $\frac{1}{3}$ in. in diameter, each with a minute central depression, scattered throughout the mucous membrane. Sections of these elevations will show, under the microscope, one or more dilated lumina of gastric glands, in which there is lying, more or less coiled, an immature larval parasite.

When examining *post mortem* an animal in which the presence of these small parasites is suspected, we find the most satisfactory procedure is, in the first place, to open the stomach along the lesser curvature, and then, holding it steadily, watch the contents carefully. A peculiar wriggling motion of the surface of the fluid will be observed, due to the movements of the worms. They will not be detected individually, however, unless a small quantity of scraping from the mucous surface be thinly spread upon a slide or other smooth surface and examined through a lens. If such a procedure be not possible at the time, some material should be scraped from the surface and preserved in methylated spirit; later on, if this be placed in water in a shallow dish, the parasites can be readily detected. These parasites are extremely slender, and measure from $\frac{1}{3}$ in. to $\frac{1}{2}$ in. in length when fully extended. It is because of their remarkable tenuity that their detection is almost impossible while mixed with the ingesta.

While these and other parasites are often a source of great disturbance in young animals, it is rare that adults suffer from their invasion, even though they may be exposed to infection and may harbour a few isolated specimens. Recently, however, one of us found them present in large numbers in cows which presented definite symptoms of illness, although hardly those usually associated with such a condition of parasitism.

The cases in question occurred amongst cows in milk. The herd of thirty was depastured on rough, dry herbage, and, in addition, was receiving a daily ration of hay, bran, &c. All the cows were in good condition, except six which had been bought at the beginning of the summer. For some weeks prior to being seen (in February) they had

been losing condition, and the milk supply had gradually diminished. When examined the pulse was weak, but the temperature and respirations were normal. The coat was staring, the animals were listless, there was weakness and uncertainty of gait, and at times stumbling; the milk supply had practically disappeared, but there was no evidence of diarrhœa. It should be noted that the cases were considered by some farmers in the district as affected with the early stages of "bone softening" (probably osteo-malacia), a disease said not to be uncommon there, and the etiology of which has not yet been investigated, but careful examination did not confirm this opinion.

In order to facilitate an inquiry into the cause, the owner agreed to the sacrifice of the worst case. *Post-mortem* examination disclosed no abnormality beyond a congested and catarrhal condition of the abomasum mucosa, which in addition was thickly studded with small circular elevations, about a centimetre in diameter, each with a minute central depression. The fluid contents of the abomasum, when examined after the manner indicated, were seen to be greatly agitated by rapidly moving minute bodies, which were surmised to be small nematodes, as proved to be the case on ultimate microscopical examination. A small quantity of the liquid contents was preserved, and from this it has been estimated that at least a hundred parasites were present in each cubic centimetre of stomach ingesta. It was apparent that these parasites were the cause of the inflamed condition of the mucosa, which, together with the irritation produced by the larvæ within the gastric glands and the consequent interference with secretion of gastric juice, was sufficient to account for the general malaise and progressive emaciation manifested by the host. The absence of diarrhœa was doubtless due to the dry nature of the herbage and other food received. At all events, in view of its almost constant occurrence in parasitic gastritis elswhere, its absence can with difficulty be accounted for otherwise.

Treatment of the remainder of the sick animals with lysol and tonics internally resulted in a gradual return to a normal condition.

The characters of these nematodes have been carefully studied and the following conclusion reached :—

The parasites are strongyles with a simple mouth, having a bursa supported by true rays in the male, in which also there are two spicules. In the female the vagina is short and the uteri divergent, the musculature being comparatively well developed. They therefore are members of the sub-family *Trichostrongylinæ* separated out by Dr. Leiper ("Third Report, Wellcome Research Laboratories, Khartoum,

1908," p. 190), and of the five genera with their species included by him in that sub-family. These specimens appear to be most similar to *Ostertagia ostertagi* (Stiles, 1892), which are characteristically found in the abomasum of cattle under similar conditions to these. Compared with *O. ostertagi*, these, however, are several millimetres shorter, but equally thick worms, both in male and female, the tail is shorter and the cutaneous fold in the female and the bursa in the male are distinctly smaller, even in fully matured specimens. But as the specific distinctions between many of these strongyles of the alimentary canal of ruminants appear much confused, we do not feel justified in identifying these specimens, or in describing them as a new species, without further work in comparison of specimens and literature as these become available.

A FOUR-HORNED MUSCAT RAM.

By J. A. N. DA CUNHA, G.B.V.C.
Veterinary Surgeon, Zanzibar.

By permission of Dr. L. A. Andrade, the Master of the Horse to H.H. the Sultan of Zanzibar, I send you a photograph of a Muscat

ram, to be reproduced if you think it will prove interesting to the readers of the VETERINARY JOURNAL.

It is really a curious four-horned fat tail ram, aged 5, presented by

the Chief of Oman to the Sultan of Zanzibar in 1909, and now shares quarters with companions in the Sultan's live stock farm. Sheep with this peculiarity have not been unknown, but they are exceedingly rare.

AN INFLAMMABLE COLIC DRAUGHT.

By WILLIAM BEDDARD, M.R.C.V.S.
Wolverhampton.

ABOUT 7 p.m. on March 11 last a black van mare was brought into the infirmary suffering from acute colic. I personally administered a draught consisting of spt. ether. nit. ℥ss., ol. tereb. ℥ii.ss., ol. lini ad. ℥viii., ft. mistura.

Just as she was taking the last mouthful the mare plunged forward and landed with her mouth open on a lighted gas bracket, with the result that the contents of her mouth caught fire and a flame issued from the front and corners of the lips for fully two minutes before one of my men extinguished it with his cap. The mouth was badly burned and the lower lip has since retracted to such an extent, owing to the cicatrices, that it is useless as a prehensile organ. The mucous membrane at the corners of the mouth is still raw, although it appears to be healing, and the mare has learned to use her teeth and upper lip sufficiently expertly to be able to eat without difficulty.

MR. W. FREEMAN BARRETT, M.R.C.V.S., Barrister-at-law, has been elected President of the Royal College of Veterinary Surgeons for the year 1910-11.

THE King has been pleased to grant the distinction of companion of the most distinguished Order of St. Michael and St. George to Mr. John Gunion Rutherford, Veterinary Director General and Live Stock Commissioner, Department of Agriculture, Canada.

Canine and Feline Clinical Notes.

A CASE OF IRREDUCIBLE INTUSSUSCEPTION IN THE DOG—ENTERECTOMY—RECOVERY.

By H. A. WOODRUFF, M.R.C.V.S.
Professor in the Royal Veterinary College, London.

This case was seen by the writer on April 2 in consultation with Mr. A. A. Comerford, M.R.C.V.S., who has supplied the history and an account of the symptoms of the patient up to that date.

Subject.—A black and white ticked Cocker spaniel bitch, aged 6. She was always previously in excellent health, and had her first litter of puppies last October, whelping without difficulty.

She was first treated in December last for worms, and subsequently the first week in February. She was shown at Cruft's on February 9 to 11, where she won prizes.

On the Monday of the following week she was brought with the history that she was passing blood per rectum: otherwise she was apparently quite healthy. There were no signs of vomiting and no heat or pain about the abdomen. She was also feeding. I prescribed castor oil and followed with tr. chlorof. et morphin. Co. This did not have the desired effect, so I tried her on bismuth subnit. and salol āā 5 gr. t.i.d. On the third day of this treatment the fæces were normal in appearance. The bitch was discharged on the 21st, as there was no recurrence. She was, however, returned on February 28, with identical symptoms. The same treatment (ol. ricini and afterwards bismuth and salol) was adopted with again apparent success, and the bitch was again discharged on March 1.

The bitch was again admitted on March 10, and the same treatment adopted, but without success. She was now off her feed, refusing anything solid, but at times enjoyed solid food. Tinct. opii ♏x., P. creta prep. gr. v. was next tried, but with no prolonged success.

On March 27 (Easter Sunday) palpation revealed an intestinal obstruction extending back from the ribs on the right side to just within the rectum.

Operation.—A hasty examination of the abdomen and rectal exploration confirmed the physical signs described, the most peculiar feature being that at one moment a long cylindrical swelling—6 to 8 in.—could be felt, whilst at another only a hard nodule as large as an hen's egg could be found.

Chloroform was given and the abdomen opened, and the peculiar

symptoms were at once explained. An 8-in.-long intussusception of the large intestine was found and quite easily reduced, for no adhesions had formed. On reduction, however, it was found that there was a second intussusception—the original and permanent one—of the whole of the cæcum into the colon. This was the hard lump constantly found, and when straining occurred it was propelled bodily down into the colon. The cæcal telescoping was quite irreducible and the question at once arose, What line of action to adopt?

It was decided to amputate the piece of bowel involved, consisting of a short piece of small intestine, the cæcum, and a short piece of colon—in all, about 8 in. of intestine—and, not having a Murphy's button, the following procedure was adopted: The vessels of the mesentery attached to this length of bowel were ligatured with fine silk, and then the large bowel was ringed around by an incision through its serous and muscular coats, but leaving the mucous lining intact. The serous and muscular layer was split down one side for about ¼ in., and then reflected from the mucous layer for this distance, which was then cut through. Thus a tube of large intestine was left, of which ¼ in. was denuded of mucous membrane and had a raw internal surface and a split down one side ¼ in. long. Into this tube the small intestine was inserted for a little more than ¼ in. and the large tube stitched round the smaller by means of an ordinary sewing needle and fine silk. Care was taken to prevent any leakage from either cut end.

The abdomen was closed in the ordinary way.

After Treatment.—No solids were given for a week—only milk. After that ordinary soft diet for another week. Fæces were passed on the third day.

The following note by Mr. Comerford supplies the further course of the case:—

The bitch is still going on splendidly, is very lively, feeds well, and passes her fæces quite normally. The wound has healed and there is no tenderness about the abdomen.

AN INTERESTING CASE OF RHEUMATISM WITH COMPLICATIONS.

By ARTHUR PAYNE, F.R.C.V.S.
Weybridge.

On January 22 I was called to a Great Dane, aged 4, whose tail was badly bruised and ulcerated, through continually banging it against the sides of his kennel, &c.

I found about one inch of the extremity in a partly necrotic and ulcerative condition, where the blood had been escaping copiously on and off for weeks. It was thickened, bruised, and sore for a distance of about 3 in. above this.

I advised amputation of this diseased portion without further delay, but the owner would not decide until Monday morning, the 24th, when I received a message asking me to operate at once.

The patient was brought to the hospital, the operation completed, and tail bandaged with liq. ferri perchlor. I was informed that the dog had shown signs of ill-health the last few days by a difficulty in rising and disinclination for food, and general mopiness. I did not prescribe for the dog, but said I would call the following morning.

The next day the patient was very lame in his left hind leg; in fact, the limb was carried and the dog apparently suffered a good deal of pain. On making an examination I found a slight swelling on the front of the metatarsus, and on pressing this pain was evinced by the animal suddenly snapping round at me.

I ascribed the lameness and general indisposition to some rheumatic affection, and prescribed acetyl salicylic acid gr. x. three times daily. The temperature had suddenly fallen during the night and the patient had been fixed in the centre of a big building to prevent bruising of the tail.

There was no appreciable change the following day, except, if any, a slight improvement. Early the next morning he was found dead.

Post mortem.—Body well nourished; two infarctions in the spleen: a livid patch in the epicardium at the heart's apex and another in right auricle. Lightly attached and sprouting from the mitral valves was a pinkish granular mass. The endocardium was thickened and cloudy. Lungs almost hepatized, œdematous, and of a bluish-red colour.

In regard to the cause of the endocarditis, I have wondered if it could have been due to invasion of the dog's body by micro-organisms through the bruised tail, these being taken up by the blood, and arrested in the mitral valves. The infarctions and lameness were, I imagine, caused by pieces of vegetation becoming detached and arrested in blood-vessels. It is possible, of course, that these lesions were complications of acute rheumatism, but it is not common to get an attack of such severity as to cause death in so young a dog.

ABSCESS IN CAT DUE TO *BAC. PYOCYANEUS.*

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.

The case was one seen by Mr. W. Margrave Lerew, G.M.V.C., Hamilton, Victoria, who writes as follows:—

"The subject was a ten-year-old cat exhibiting a tumour about the size of a large cherry-plum on the back of the neck. The tumour was circumscribed and appeared cystic, with semi-fluid contents. The owner informed me that it had been opened twice and syringed out with pure lysol, but that after each operation it gradually refilled. I completely removed the tumour and found it to be cystic in nature, with purulent contents. The wall was dense and fibrous, unless where it was in contact with the skin, which was denuded of hair. The animal was otherwise healthy."

Mr. Lerew forwarded a small quantity of the contents of the cyst for examination. Microscopical examination of this material showed a few diplococci and many short bacilli, a large number of which were contained within the pus cells. Culture media inoculated developed numerous colonies of a bacillus which proved to be characteristic of the *B. pyocyaneus*, in addition to a few colonies of *Staphylococcus aureus.*

Abstract.

ANTISEPSIS IN VETERINARY SURGERY BY MEANS OF TINCTURE OF IODINE.

By M. R. BISSAGE.

The old proverb which says that "medicines have their fashion, like hats," is still true. The use of tincture of iodine as a disinfectant of urgency to the skin and wounds is not, however, a new mode. I have used it advantageously for twenty-five years for my patients and myself in little professional accidents, without having any claim to be an innovator.

Recent publications in the medical journals give to this use of iodine an aftermath of actuality; it will be perhaps interesting to study summarily the broad lines for the employment of this old therapeutic agent of undeniable utility in our medicine, and which can render great service in daily practice.

Authorized works have shown for some years that painting the skin with tincture of iodine causes almost as complete and lasting an asepsis of the skin as the usual procedure by brushing, soaping, and antiseptic washing. If such a cleansing followed by a rinsing with

alcohol suffices for surface disinfection, the asepsis of the skin is ephemeral and insufficient in depth.

With tincture of iodine, thanks to its power of penetration, the iodine infiltrates into the skin and disinfects the excretory glandular canals and intercellulary spaces.

Washing causes the epithelial cells to swell, obstructing the spaces and canals, hindering the penetration of the iodine. In veterinary practice one ought, therefore, to be content in small interventions such as opening an abscess, neurotomy, thoracentesis, puncture of the cæcum, &c., with wiping the skin dry with a tampon of wadding and painting it with tincture of iodine. In cases where the skin is too dirty, it should be washed with alcohol or ether followed by drying before the application. As an urgency dressing for large jagged wounds, broken knees, wounds from shafts or harrows, it is preferable to abstain from all washing, which draws pathogenic germs into the wound. One should simply remove the greatest soiling with a pad of wadding, and paint all the broken surfaces and neighbourhood of the wound with tincture of iodine.

Without contra-indications in veterinary practice save, perhaps, for the eyes and ears, one should employ the tincture with the addition of water and pot. iodide; this process of disinfection has multiple applications in daily practice by reason of the rapidity and ease with which it can be executed. It is above all indicated in the country in surgical urgency, where time and means fail for procuring a serious cleansing of the skin, of a bad wound, or of the field of operation, for an intervention that cannot wait. This method is valuable in animals where the skin is thick, provided with voluminous glands, often dirty and deeply infected.

The operatory manipulations are more simple, shaving of the dry skin, or even cutting the hair with the shears or scissors, cleaning with wadding, then wide painting of the region with a tampon soaked with tincture of iodine fixed to a piece of stick or held in forceps; wait for a moment for the evaporation of the alcohol. If the skin is very fine, one can remove the excess of iodine with wadding or by rinsing in alcohol. After suturing, put a little of the liquid on the points.

In veterinary practice one can employ, especially for the horse, the officinal tincture of iodine up to one-tenth; in blood horses one should add alcohol to reduce the tincture to a lower strength. It is necessary only to employ a liquid well preserved in a coloured flask stopped with emery to avoid too great a causticity.

In 1906, Hensner proposed using iodized benzene, 1 in 1,000, for disinfection of the skin, on account of its solvent power for fatty bodies; this practice has not taken on, the benzene being more irritant than alcohol.

In the dog and certain irritable horses, one can use iodized chloroform advantageously, recommended by Professor Chassevant (1 gm. of iodine to 20 gm. of chloroform), which has the same properties as tincture of iodine, and which provokes neither pain nor desquamation, and preserves the skin supple and intact.

It would be interesting to try the use of iodized vasogen, whose great power of penetration is used considerably in veterinary practice.

Tincture of iodine is also indicated in urgency cases in burns, wounds always easily infected. A rapid cleaning to remove soiling, and

to dry, and wide and deep painting over the denuded zone will suffice.

The employment of tincture of iodine is valuable as a prophylactic in our medicine where professional inoculations are frequent with the operator, existing wounds before inoculation, and which present some danger, may be touched with tincture of iodine. Excoriations, wounds arising in the course of an operation in a septic media benefit largely from this procedure, which I have used for a long time for myself with advantage. Disinfection of the hands of the operator before a big operation may be easily and usefully made by plunging the hands, in case of need, in tincture of iodine, which can easily be removed, the operation terminated by washing in ammoniacal water.

This procedure is recommended in operating for hernia and cryptorchids. We have used with success, L. Naudin and myself, for several years, painting with tincture of iodine the region operated on in point and line firing immediately after operation, before letting the horse up; one asepticises thus for several days the wounds of the points and the lines, and thus avoids pruritus, synovitis, and sloughing.

We have only praise for this procedure, both in fine and coarse-bred horses. As a *résumé*, painting with tincture of iodine effects a sufficient asepsis of a certain duration, and is an easy and little troublesome application. This procedure seems to have actually acquired an important place in urgent surgery, which is just as well for practitioners to keep in memory.

(*Revue Générale de Médecine Vétérinaire.*)

JUBILEE OF PROFESSOR WILLIAM SCHÜTZ, M.D. & D.V.M., BERLIN.

On April 16, 1910, Professor Dr. William Schütz completed fifty years of work as a veterinary surgeon. He was born on September 15, 1839, in Berlin.

He gained his diploma at the Veterinary School in Berlin, on April 16, 1860. Afterwards he studied human medicine at the Berlin University. He then took up a position as district veterinary surgeon at Fischhausen, and in 1866 took service in the field at Trantenau and Königgrätz. On April 16, 1867, he returned to Fischhausen after the war, and was appointed departmental veterinary surgeon, and in October 1 he was promoted to the position of lecturer on special pathology and therapeutics at the Veterinary School. Notwithstanding the duties of his official position, he gave some of his time to scientific work, and contributed articles to the professional magazines on such subjects as "Pyæmia," "Epidermoidal Cancroid," and "The History of the Growth of the Tumour Albus." On May 4, 1868, he received the degree of M.D. of Berlin University for his work "On the Peat Hog." A year later he wrote a pathologic-anatomical article in *Virchow's Archives* on "Rickets in the Dog."

For the next ten years Schütz taught pathological anatomy and contributed articles to the journals on "The Knowledge of Dignathia,"

"Nephritis Lymphosarcomatosa (tuberculosa) of the Cow," "The Genuine Inflammation of the Lungs of Horses," "Influenza Erysipelatosa" (contagious erysipelas of the horse).

The influence of Schütz on Robert Koch through his works was shown by the great triumphs in bacteriology which the latter achieved.

In 1885 and 1886 he was working in the protective and curative inoculation of swine affected with erysipelas and pneumonia; in 1887 on pneumonia and strangles in the horse; and in 1892 and 1894 on tetanus and foot and mouth disease. In 1894 he commenced his researches into glanders, and wrote articles on the "Pathological Anatomy of Glanders," "Mallein Tests," "The Grey Transparent Nodules in Horses' Lungs," "The Study of Glanders."

At the beginning of the nineteenth century Schütz chiefly devoted his attention to tuberculosis, hæmoglobinuria, and glanders.

Schütz and Koch, in 1902, wrote a report on "Tuberculosis of Cattle and Men" for the Ministers of Instruction and Agriculture, and in 1905 the subject of this article contributed a paper at the International Congress at Budapest on "The Relation Between the Tuberculosis of Men and Animals." More recently the agglutination and complimental tests for glanders, along with inoculation of mallein have been generally adopted in Prussia, owing to the researches and initiative of Schütz.

We thus see that for fifty years of his life the man now honoured has been an enthusiastic investigator, dominated by an ardent desire for research. He stands on the same plane as Rudolf Virchow and Robert Koch as a benefactor of his own and other countries. His great knowledge has frequently led to him being consulted and trusted as an adviser on animal plagues in civil and military circles. His fascination as a lecturer can only be appreciated by those who have sat at his feet, his masterly exposition of his subject, and the way that he can make the most difficult, and at times somewhat dry subject interesting, adds to his strength as a teacher.

He has ever been a fighter. All his views have not been calmly accepted. He has never shrunk from publicity. His strong personality and the force of character he possesses, have done much to advance the cause of the science he has at heart.

The Germans (and may we add all scientists of whatever nationality) hope that he may still have many useful years of service.

(*Deutsche Tierärztliche Wochenschrift.*)

Reviews.

THE ENCYCLOPÆDIA OF SPORT.—Complete in about thirty parts; issued fortnightly, illustrated with coloured plates, photographs, and drawings. Price 1s. per part. Published by Mr. William Heinemann, London.

We have received the first two volumes of this work which gives promise of exceeding in excellence anything in the way of an encyclopædia of sport with which we have been brought into contact. It is practically a new work, although it originally appeared twelve years ago. Since then, however, sports have become more numerous and the term more inclusive, and consequently such subjects as "aeronautics" were not dealt with then. The first volume includes both aeronautics and angling. It is right up to date in each case, and is more complete than any work previously published. Moreover, it is written in such a style as to be readily followed by the amateur.

Part II. is quite as interesting and instructive as the first part. Amongst other subjects it deals with archery, athletics, and automobiles, and will constitute a work of reference in each of those sports. The development of the automobile is given chronologically, and is so far up to date as to include a photograph of the motor-sledge built for the Scott Antarctic Expedition of this year. In the athletic section are some wonderful snapshots, which should be seen to be appreciated. The type, photographs, and drawings are all excellent, while the coloured plates are magnificent.

The work will certainly appeal to all lovers of sport, and we recommend our readers to lose no time in becoming possessors of the volumes as they appear.

VETERINARY MEDICINES: Their Actions and Uses. By Finlay Dun. Twelfth edition. Revised and edited by James Macqueen, F.R.C.V.S., and H. A. Woodruff, M.R.C.V.S., Professor in the Royal Veterinary College, London. Demy 8vo., pp. xii. + 822. Price 15s. Published by Mr. David Douglas, Edinburgh.

A standard work that has stood the test of time and has reached the twelfth edition really requires very little to be said of it to emphasize its merits. Science in its various phases has made very rapid strides in recent years, and pharmacology is a striking example of that fact. So much so that many of our ideas as to the actions of drugs have had to be entirely remodelled, and many new drugs have been introduced whose actions have been already definitely ascertained experimentally. It is under these circumstances that we welcome the endeavour of Professors Macqueen and Woodruff to bring this well-known work quite up to date. On looking through it we find that much of the old matter has been deleted, and entirely new matter has been introduced.

The first chapter in its relation to bacteriology has been rewritten in a most excellent and lucid manner, and includes the recent views regarding immunity and the comparatively recently recognized phenomenon of anaphylaxis. A new chapter has been introduced on "Salt Action and the Ionic Theory." We welcome the introduction of

many new drugs, such as the various compounds of bismuth, silver (though argyrol is omitted), and arsenic, adrenalin, yohimbine, trypan-blue, and trypanred, &c. In vain, however, did we look for the well-known hydrastis. Directions as to the use of mallein, tuberculin, and various antitoxins, sera, and vaccines are introduced. The arrangement of the drugs obtained from the vegetable kingdom is rather haphazard, and some definite order would have been preferable. We think it is a pity the dosage of morphia for dogs was not brought more into line with recent knowledge on that point. The old quoted dose of $\frac{1}{10}$ gr. to $\frac{1}{4}$ gr. is repeated, whereas we are daily administering doses of i.gr. and ii.gr. to dogs of the terrier and retriever type, respectively, with excellent results for surgical purposes. In those doses, moreover, the drug is, after apomorphine, the most certain and rapid emetic for dogs we know.

The index of diseases and remedies at the end of the book has also been revised and now consists of nearly seventy pages of small type. It includes a very excellent list of animal parasites and the different varieties of ringworm. We recommend all students and practitioners to buy this edition of the book. They will be amply repaid.

Translations.

PHALANGEAL OSTEITIS COMPLICATED WITH OSTEITIS OF LAMINITIS.

By M. G. MOREL.

Veterinary Surgeon in the 2nd and 3rd Cuirassiers.

According to Professors Sendrail, of Toulouse, and Leblanc, of Lyons, Professor Liénany renders a just homage to the beautiful works of the Sammur School on phalangeal osteitis of inferior localization and frequent fatigue osteitis.

I have recently had a case of pedal osteitis following osteitis of the phalanx primitively diffuse in a mare.

History.—Rigolette II., a mare, aged 6, no record of origin, but externally showed "much blood." She was shown to me on September 18, 1909, for slight off-fore lameness and abscess on the neck. The latter was treated. The foot, slightly hot, showed general sensitiveness of the sole. The officer in charge had noted that Rigolette went feelingly in front. This mincing gait in front was particularly accentuated when the ground was hard.

Diagnosis.—The diagnosis given was phalangeal osteitis. Baths, with subsequent hygienic care, were ordered.

Evolution.—The clinical situation remained the same for five days; the abscess of the nape was cured; there was no increase of lameness, but it did not recede.

On September 24 Rigolette had the characteristic walk of laminitis, with notable heat of the feet. Prognosis grave: there was a complication of osteitis of laminitis, which was grafted on generalized and diffuse osteitis of the third phalanx.

Treatment.—Copious bleeding: pilocarpine, antifebrin, baths. Deformation of the hoofs becomes gradually more prominent; the mare is lean; she is cast. Rigolette was slaughtered on November 24 at Lille, and I obtained her two anterior feet.

Lesions.—After prolonged boiling I withdrew the third phalanges from the horny box and found them covered with stalagmites over the whole extent of their anterior face. The indentations separating the basilar and retrossal processes are transformed into a gap; the external basilar apophyses overhang the anticular surfaces considerably; the retrossal apophyses are prolonged much more than in the normal state behind the preplantear fissure in this mare of 6 years old. The anterior edge was crumbling away. The vascular openings, considerably dilated, have so rarefied the osseous substance that it had very soft consistency. On section the spongeous substance was ecchymosed and bluish. The compact substance of the anterior and inferior surfaces are ecchymosed, and the situation of a rarefying and intense osteitis.

Conclusion.—In conformity with the ideas of our ancient master veterinary, Major Joly (*Les maladies du cheval de troupe*), we find here a good case of laminitis, preceded for a long time by diffuse phalangeal osteitis, and that the lesions of the third phalanx extended not only over all the anterior, superficial, and deep regions of the bone, but over its posterior apophyses, which were for a long time secretly worked by the local habitual manifestations of the osteitis of fatigue.

(*Revue Générale de Médecine Vétérinaire.*)

FRACTURES OF THE OS SUFFRAGINIS IN THE HORSE.

BY VETERINARY-SURGEON ERICH SILBERSIEPE.

SILBERSIEPE, after a comprehensive review of literature, has made a study of fractures of the first phalanx with regard to their etiology, pathologic anatomical changes, symptoms, differential diagnosis, course, prognosis, and therapy, and at the same time examined the internal architecture of the first phalanx and its relation to the statics and mechanics of this bone. The most important results of his examinations are as follows:—

(1) The pastern bone of the horse shows, as Eichbaum and Tschokke have already indicated, with regard to its spongiosa, an architecture which is in closest relationship to the statics and mechanics of this bone. For example, where the pressure and pull is the strongest the spongiosa is welded together into compact tissue, and there, where the proximal surface of the joint has most strain put upon it, the bone plates, which stand the pressure, are the strongest. At this place also the spongiosa is the best grown and very close and compact.

(2) Three-fourths of all cases of fractures of the os suffraginis in the horse occur in the fore-limbs.

(3) Fractures are caused by external and internal influences. The latter occur not only from diseased conditions, but from pecularities in the architecture of the bone.

(4) According to their origin one may distinguish (*a*) sagittal fractures; (*b*) segmental fractures; (*c*) horizontal fractures (transverse fractures); (*d*) split and brittle fractures; (*e*) mixed forms.

(5) For a definite healing of fractures of the pastern, the transformation processes are of the greatest significance. They show us that in spite of adverse views on usefulness after recovery, results are favourable, and that the pastern bone regains its full functional activity through the product of the transformation processes.

(*Deutsche Tierärztliche Wochenschrift.*)

THE EMPLOYMENT OF OLEUM TEREBINTHINÆ IN SUBCUTANEOUS INJECTIONS.

By Veterinary-Surgeon I. HOERLYK.

Starup.

The subcutaneous injection of oil of turpentine is well known as a powerful revulsive. It renders good service in the treatment of udder inflammations in the cow, especially in that ailment which is very similar to the yellow gault which Hess and Borgeaud have described. This inflammation of the udder occurred in a dairy of about eighty milch cows. On this standing, in the course of the winter of 1906-1907, twenty-six cows were treated. Four centimetres of oil of turpentine were injected subcutaneously, and in order not to hinder milking, the drug was introduced at the upper wall of the udder. Severe œdema followed. This disappeared after about fourteen days, and left a node as large as a hen's egg, with another one under it as big as a man's fist at the point of injection. These nodes broke up in the course of a further fourteen days. In gangrenous and purulent inflammations of the udder as well as in fresh affections with evil-smelling secretions, turpentine injections do good. Since the beginning of the turpentine treatment 104 cows which suffered from different forms of udder inflammation have been treated. Of these, sixty-nine recovered after three to eight days, and sixteen after eight days to three weeks, and they gave milk again from the affected quarters. Nine cases of septic inflammation and eight cases of abscesses in the udder ended in hardening and atrophy. These subjects were fattened. Two cows with gangrenous inflammation of the udder died.

Further subcutaneous injections of turpentine were employed in inflammation of the lungs in horses, and here 4 c.c. were injected in the breast. A widespread œdema resulted, ending after three to four days in abscess formation. These abscesses generally burst themselves. If this does not happen after four days they should be opened. This favourable abscess formation may be taken advantage also in inflammation of tendon sheaths. The injection aids prognosis. If the horse reacts to it severely a favourable view may be taken as to the recovery of the patient. Twelve horses, two with double-sided pneumonia, have been treated thus in the last two years without a death occurring.

In inflammation of the womb the cows were experimented on

with turpentine injections. Four centimetres were injected in the right side. There was considerable œdema at the site of injection. After two to four days fever declined, and the general condition was better.

The injections were also used advantageously as a prophylactic against tetanus from wounds and picked up nails, and in one case each of hæmorrhage from the lungs and metastatic strangles they had favourable effects. The favourable effect of oil of turpentine is brought about by formation in considerable number of white blood corpuscles, their determination to the point of injection and to the part they play in the healing process. Perhaps also a part of the turpentine is absorbed and causes an increased secretion of the glands and leads to healing.

(*Maanedskrift für Dyrlaeger.*)

Correspondence.

THE "DRY BIBLE" SCARE.

To the Editors of the VETERINARY JOURNAL.

SIRS,—I have the honour to draw your attention to a report appearing in the VETERINARY JOURNAL of March, 1910, on "South Australian Dry Bible," by Veterinary-Surgeon Desmond, in which the following paragraph occurs: "In the *Journal of Agriculture* for August the following figures relating to 'dry bible' are quoted from statistics furnished by the Government Statist. In 1907 there were 47,480 deaths from 'dry bible'; during 1908 there were 11,133 deaths of cattle, both within and outside counties, 'dry bible' being responsible for more than one-fifth of the number—namely, 2,395. The losses to this State are enormous, as the value of the animals can be computed to be between £4 and £5 a head."

The figures quoted in the above paragragh are absolutely incorrect, and, as the VETERINARY JOURNAL has a large circulation both in the British Islands and other parts of the Empire, gross exaggeration and alarmist reports of this kind are apt to brand this State, which is one of the healthiest countries in the world for stock, as a disease-stricken, unhealthy locality, and might prove, unless contradicted, a disastrous advertisement.

The following is a statement prepared by the officers of this Department, giving the number of cattle affected by paralysis (so-called "dry bible") for five years ending June 30, 1909:—

For Year ending	Number of cases	Dairy cattle	Other cattle	Killed	Died	Recovered
June 30, 1905	571	434	137	—	50 %	—
" 1906	610	—	—	—	70 %	—
" 1907	585	558	27	3	538	44
" 1908	289	252	37	—	232	57
" 1909	356	259	97	—	299	57

I am instructed by my Minister, the Honourable the Commissioner of Crown Lands, to request that you will kindly contradict these inaccuracies as soon as possible.

I have the honour to be, Sir,
Your obedient servant,
R. JOHN NEEDHAM,
Chief Inspector of Stock.

Live Stock and Brands Department,
Adelaide,
May 9, 1910.

A PLEA FOR REFORMED SLAUGHTER-HOUSES.

To the Editors of the VETERINARY JOURNAL

SIRS,—Why do not social reformers of all kinds, whether they are meat-eaters or not, interest themselves in the slaughter-house question? Why do they not bestir themselves to induce the responsible local authorities to take concerted action in regard to the inhuman and insanitary dens of butchery which are a cause of widespread demoralization, physical and moral, in thickly populated districts?

The recent Report of the Admiralty Commission, appointed in 1905 "to consider the humane slaughtering of animals," has the following important recommendation:—

> "That, in the interests not only of humanity, but of sanitation, order, and ultimate economy, it is highly desirable that, where circumstances permit, private slaughter-houses should be replaced by public abattoirs, and that no killing should be permitted except in the latter under official supervision."

The advantage of the public over the private slaughter-house has been repeatedly demonstrated. Yet, owing to the unaccountable apathy of the public, the realization of humanized methods of slaughter is apparently no nearer coming to pass than it was twenty-five years ago, when the late Sir Benjamin Ward Richardson first urged its adoption upon the authorities, and we still remain the only civilized people in Europe, if not in the world, without a comprehensive public abattoir system.

The establishment of properly registered and inspected abattoirs, open always to the observation of humane people, is indeed the only possible way of securing the merciful slaughter of animals.

I remain,
Yours faithfully,
JOSEPH COLLINSON.

THE DEATH OF KING EDWARD VII.

To the Editors of the VETERINARY JOURNAL.

DEAR SIRS,—Will you kindly permit me, knowing no other colleagues in England, to express my share of the profound sorrow at the death of your beloved King?

We Hungarians also knew your late King to be such as you have described him, and he was as well beloved by us as by you.

I feel your great loss, and I trust that your hope concerning to your new King will be fulfilled.

Will you and all my English *confrères* accept my heartfelt condolence?

Yours faithfully,
L. Laszlo,
Veterinary Surgeon.

VI. 16, 10, Füresgyarmat,
Bekes M., Hungary.

Books and Periodicals, &c., Received.

Manual of Tropical Medicine by Castellani and Chalmers (Messrs. Bailliere, Tindall and Cox, London), 21s. net; Proceedings of the Royal Society of Medicine; Bulletin of the Bureau of Sleeping Sickness; Bulletin of Bureau of Animal Industry (U.S.A.); Journal of the Royal Army Medical Corps; The Rhodesian Agricultural Journal; The Agricultural Economist; The British Journal of Tuberculosis; Encyclopædia of Sport. Parts I and II. (Mr. W. Heinemann.)

Letters and Communications, &c.

Mr. L. E. W. Bevan; Mr. Maxwell Edgar; Dr. Sydney Dodd; Lt.-Col. J. Moore; Mr. Laszlo; Mr. Collinson; Inspector Needham; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Secretary of the Royal College of Veterinary Surgeons; Secretary of the Cape of Good Hope V.M.A.

Note.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the Journal should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

THE

VETERINARY JOURNAL

AUGUST, 1910.

Editorials.

THE "STABLE MANAGEMENT" PETITION AND THE COMPULSORY PUPILAGE QUESTION.

THE recent petition of the students in regard to a re-arrangement of the present regulations which require all the subjects of any one year to be passed at one and the same time brings again to the front a matter of great importance, at any rate to them.

That such a simple, and yet such an essential and important, subject as stable management should be the chief stumbling-block to any examination is a serious reflection upon the amount of practical knowledge which has been acquired up to that point in the curriculum, and is a very strong argument for the removal of the subject to the first year of study or else for the insistence on compulsory pupilage. It would be a good plan to re-arrange the Class A, B, and C subjects in such a way that "Hygiene and Stable Management" form one subject, and are taught in the first year, for it is very essential that the student shall be acquainted with the habits of animals in health before he can appreciate them in disease. Given a knowledge of animals in health, of hygiene and stable management, the Class A student will be of service to the general practitioner and have no great difficulty in obtaining useful and profitable places during the various vacations.

He will have a fair idea of the dietary and general habits of our various classes of patients in health, a knowledge of which

the average town-bred student of the present day, who goes straight to college from school, is distinctly lacking, and which he has very little chance of acquiring except by coming in contact with animals in some practical capacity. That some such change is necessary is too obvious to need comment. Even the students themselves admit it by their inability to pass the examination test, and it has been for some years the general cry of the practitioner that he could not get pupils of practical use to him, solely because they are apt to expose their ignorance of the ordinary things of daily life when questioned or "summed up" by a keen client.

It is quite time we put our house in order upon this point, and the question of a compulsory pupilage, or some other means whereby a satisfactory knowledge in "stable management" and hygiene will be taught to the student in the early days of his career, will have to be faced very seriously at no distant date.

THE EXAMINATION AND REGISTRATION OF STALLIONS.

OUR readers will peruse with interest the third annual report of the Chief Veterinary Officer for the State of Victoria, Australia, which we publish in this issue. In addition to furnishing details of the examinations conducted during the past year (1909), the report gives a valuable *résumé* of three years' working of the system in vogue in Victoria.

The unsoundnesses scheduled as hereditary are side-bone, ring-bone, bone spavin, bog spavin, and thoroughpin, curb, cataract, and roaring, and possibly few veterinarians will object to any of these being included. The small number rejected for roaring is surprising; the statistics for the years 1907 and 1909 show that of 491 light stallions examined none were returned as roarers, while those of 1908 show that of 295 only two were so certified, the percentage for the three years being only 0·25. Side-bone, as might be expected, is the most serious defect in heavy horses, it being responsible for the rejection of 20 per cent. of the total number of draughts examined, while spavin heads the list in light horses, with a percentage of 3·18 of those submitted. During

the three years the system has been in operation 1,312 draught horses, 787 light horses, and 565 ponies have been examined, the rejections for unsoundness classed as hereditary being 20·07, 9·27, and 3·54 per cent. respectively. The report deals concisely with rejections on account of failure to reach an approved standard, but this aspect does not interest the veterinarian to the same degree.

While Dr. Cameron and his staff are to be congratulated on the result of their labours, and the State is to be commended for the adoption of such an excellent principle as the examination of stallions, we regret fuller particulars are not available. Certain conclusions may, however, be inferred. The system has not the sanction of Statute law; it is only compulsory for horses competing for prizes at shows. A stallion, although denied a certificate, is not debarred from serving mares for fee, and it is not mandatory for the owner to advise clients of his defects; and a stallion once receiving a Government certificate of soundness retains it for life, despite any future pathological developments, however grave. If these deductions are correct, they imply very definite limitations to the good results one would expect to follow from a complete system of State veterinary examination of travelling stallions, and it is to be hoped Dr. Cameron will not rest satisfied until they are removed. Any further developments would, however, almost of necessity imply some method of compensation; otherwise the many breeders would benefit almost entirely at the expense of the few owners of stallions—a position that in some measure must at present exist.

General Articles.

STRANGLES.[1]

By CAPTAIN A. G. TODD.
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STRANGLES was one of the first of equine diseases described by the earliest writers in veterinary science. They remarked on its enzootic character, its contagiousness, and its frequency in young animals compared with old. Solleysel described it, in 1664, as a disease which young horses had to pass through in the same way as children had to pass through small-pox. Convinced of its contagious nature, he recommended the isolation of the affected, and pointed out that the most common way for horses to become infected was by drinking out of buckets which had been previously used for affected animals. Lafosse proved by experiments, in 1790, that it was contagious, and Viborg confirmed this in 1802.

In 1873 Rivolta observed chains of cocci in the pus of abscesses, but Schutz [9], in 1888, was the first to publish a detailed description of the organism. Sand, Jensen, Poels, Baruchello and many others have since contributed to the bacteriology of the subject.

The cause of strangles is the *Streptococcus equi*, which is found in large numbers in the nasal discharge and abscesses, which are characteristic of the disease. In unbroken abscesses it is found pure, but in the nasal discharge it is associated with other microbes. The prevailing form of organism is an undulating chain of cocci, each chain being made up of thirty to sixty organisms. The length of the chain varies with the situation: in throat abscesses they are longer than in the nasal discharge, where individual cocci, diplococci and short chains are principally found. This variation in the length of the chains is due to its surroundings. A similar condition may be observed in different culture media, the more liquid they are the longer the chain, and *vice versa*. The method of reproduction is by transverse division.

The organism stains well with all aniline dyes, and retains the stain by the method of Gram.

BIOLOGICAL CHARACTERS.

Growth takes place on most media at room temperature. It is both aerobic and anaerobic, and is non-motile.

[1] Read at the meeting of the National Veterinary Association, London.

Bouillon.—In bouillon a white deposit may be seen after twenty-four hours growth resting at the bottom of the tube. When shaken the fluid becomes turbid, but the deposit soon settles, leaving the upper part of the tube clear. The growth, which consists mostly of long chains of streptococci, is more abundant when serum is added to the medium.

Blood Serum.—On the surface of blood serum typical, sticky, transparent, colourless droplets form, which are separate at first, but afterwards confluent. In the water of condensation which collects in the bottom of the tube a sediment forms, which consists of long chains of streptococci.

Agar.—On agar slants colonies appear which are in the form of small, flat, circular, greyish-white spots; these are never confluent and are easily overlooked.

Gelatine.—On gelatine it grows as very small white spots, but the growth is never abundant, owing to the low temperature at which gelatine has to be incubated.

Potato.—There is no visible growth on potato. Sand and Jensen state that it grows into the surface of the potato and cannot be seen, but I have not been able to verify this.

Milk.—It grows in milk, causing curdling in six to eight days.

Glucose.—There is no gas evolution.

Vitality.—A temperature of 60° C. kills it in one hour.

A temperature of	60° C.	kills it in	one hour.
,,	80° C.	,,	half an hour.
,,	100° C.	,,	a few minutes.

Sunlight destroys it in eight hours, and desiccation in three weeks [1]. It is killed in fifteen minutes by the following: perchloride of mercury, 1—1,500; carbolic acid, 1—200; creolin, 1—80 [2].

Cold does not appear to affect it as much as heat, bouillon cultures frozen for two days are still capable of growing when brought back to a suitable temperature. Although it is easily cultivated in the various laboratory media, its virulence decreases even under the most favourable conditions of artificial cultivation. To bring it back to its original virulence it is necessary to pass it through some susceptible animal.

Pathogenesis.

White mice die in two to four days when inoculated subcutaneously with minute doses of pus or cultures. The infection is general, and the organism can be isolated from the liver, spleen, kidneys, peritoneal cavity, lungs, heart, blood, and lymph glands. There is abscess formation at the seat of inoculation, and if death

is delayed, as is the case when organisms of low virulence are used, abscesses form in adjacent lymphatics, and afterwards in the lungs, liver, kidneys, and other organs.

Rabbits and guinea-pigs are not very susceptible to the streptococcus. Large doses injected into the veins or peritoneal cavity are necessary to kill them. Birds, dogs, swine, sheep and cattle do not contract the disease when inoculated with cultures.

Local inflammation, necrosis, and abscess formation results when horses are inoculated subcutaneously, and this may or may not be accompanied by systemic disturbance. Intravenously small doses cause a thermic reaction lasting twenty-four to thirty-six hours and no general symptoms. Strangles pus rubbed into the skin of healthy horses is said by Joly to produce a typical eruption, but in the few observations I have made on horses of 5 years of age and over, I have not been able to produce any eruption, even when the skin was scarified.

Strangles pus rubbed into the nasal mucous membrane, or coming in contact with any mucous membrane, is often stated to be a sure way of transmitting the disease, but the following observations tend to show that, at any rate in old animals, additional influences are necessary. The nostrils of three horses, aged 6, 11, and 14 respectively, were smeared with both strangles pus and virulent culture (pus in one nostril and culture in the other), and they were kept under observation for one month; the results were negative.

Another horse, aged 14, had 20 c.c. of virulent pus placed at the back of his mouth, and he remained in perfect health for two months afterwards, when he was destroyed for incurable lameness. *Post-mortem* examination revealed nothing abnormal as a result of the observation. Three other horses under orders for destruction, aged 8, 11, and 15 respectively, were given gelatine capsule balls, each containing 10 c.c. pus from a fresh strangles abscess; their temperatures were afterwards taken twice daily, and they were kept under close observation for a fortnight, during which time they were in perfect health. They were then destroyed and a careful *post-mortem* examination made, and not the slightest abnormality could be found.

These observations would undoubtedly be of more value if they had been made on foals, but they are interesting in that they show that aged horses in good health and living under favourable conditions possess an extraordinary high degree of resistance to enormous quantities of virulent infective material. The same pus inoculated subcutaneously into mice caused death in four days.

Schutz, Sand, and Jensen say that the disease is more likely to develop when, before the organism is introduced, the nasal mucous membrane is injured or in a state of catarrh. In one old horse placed at my disposal, a virulent culture rubbed into an abraded schneiderian membrane did not produce the slightest effect. In catarrh, in addition to a large mucous surface being denuded of its protective covering, an animal's vitality is lowered considerably, so that one can understand such animals being more susceptible than others, but I have not had an opportunity of testing the susceptibility in such cases. No matter at what part the streptococcus enters the body, it does not ordinarily extend far from the point of entrance. For this reason the upper air passages and throat are most frequently affected. Its extension is principally along the lines of the lymphatic circulation. It may be carried by the blood stream to distant parts of the body, but this is, fortunately, rare, otherwise malignant strangles would be more common than it now is.

Although it is within the bounds of possibility for the streptococcus alone to cause the disease to develop in susceptible animals, clinical and experimental evidence point to an additional factor being necessary in the majority of cases. Some observers have suggested that the way is paved for the streptococcus by an invisible virus, and others havs stated it requires the aid of other organisms, but no observations of any value have been brought forward to support these views. It is certain, however, that predisposition plays an important part in the development of the disease.

Age is a well-established predisposing cause. It can be safely said that predisposition is inversely proportionate to the age. Viborg and Hertwig [2] observed that 70 per cent. of cases occur in horses under 5 years of age, 20 per cent. over 5 years of age, and 10 per cent. in horses over 15 years or age.

Adverse climatic conditions, long train journeys, domestication, fatigue, standing about at fairs, change of food, change of stabling, recent illness, in fact anything which produces a temporary lowering of vitality increases susceptibility.

An outbreak of the disease is described in Champetier and Payrou's "Étude sur la Gourme" [6] which well illustrates the influence of hardships, cold, and fatigue. During the strikes at Limoges, in France, several brigades of mounted police were sent from distant parts to assist in quelling the disturbance and keeping order. Some of their horses were under 5 years of age, but the majority were over. Nights were cold, work long and severe, and

the feeding very irregular. To protect them as much as possible from the inclemency of the weather, they were picketted in the riding schools of the cavalry regiments of the district. Strangles broke out simultaneously and indiscriminately in old and young; nearly every horse was attacked. During their work they were in frequent contact with the horses of the local cavalry regiments; intercommunication between them was unavoidable, but the disease did not extend to the cavalry. Moreover, when the mounted police left Limoges at the termination of the strikes, there was no time to carry out disinfection of the buildings before they were re-occupied by the cavalry, and although the cavalry horses were of all ages, young as well as old, not one case of strangles was observed.

Vitality in young animals fluctuates much more than it does in old ones, which perhaps accounts for age being such a prominent predisposing cause. Sudden changes of any kind, even though they may be for the better, at first produce a temporary loss of resisting power, which predisposes them to any prevailing disease.

Picquet [3] has seen remounts suffer from strangles after purchase in Hamburg, again after recovery when moved inland to Hanover, and again after they have joined their regiment on the frontier. This, although rare, is a good instance of naturally-acquired immunity failing to protect when sudden changes are made in the animals' surroundings, and should not be forgotten when artifically immunizing horses.

In discussing the vitality of the organism, and its biological characters it was pointed out that it could resist desiccation for three weeks, so that in tracing the origin of an outbreak one has to consider the danger from infected forage, bedding, manure, water troughs, mangers, or any part of the stable contaminated by nasal or abscess discharges. It is quite possible for any of these to be the infecting medium, but if we take into consideration the rapidity with which it loses its virulence, even under the most favourable laboratory conditions, it is not unreasonable to conclude that the danger from any of these sources would depend on the length of time the organism had left the body of an affected animal. This is supported by laboratory observations. It is only with the greatest difficulty that one can get exposed infective material to grow on the most favourite medium. Strains of the organism whose virulence is on the decline can, however, easily be fortified by passing them through susceptible animals.

In remount stables and on board ship the source of the organism

is nearly always an animal in the incubation stage of the disease. At Lusk remount depôt, from April 1, 1906, to March 31, 1907, out of a total of thirty-three cases of strangles, fifteen were so affected on arrival, and in the following year, during the same period, eleven out of forty-three were similarly affected on arrival. But it is not in such outbreaks as these that there is any difficulty in tracing the origin.

Strangles occasionally breaks out in stables which have had no recent arrivals and where there has been no known contact with infected horses. An example of this is where remounts have finished their training, are transferred to the squadron stables, and one or two of them will develop the disease. Although one feels convinced that the source of the infection has not been outside the stable, a careful examination of all the horses will not reveal even a suspicion of a case of strangles. How are such cases to be accounted for?

There are some who maintain that the *Streptococcus equi* is a normal parasite of the upper air passages of equines, and that it only becomes pathogenic under certain conditions. This has not been supported by any scientific observations, and has, therefore, no real value. What appears to be responsible for this hypothesis is that a streptococcus is found in the upper air passages of healthy horses which is indistinguishable from *S. equi*. Future research may demonstrate that there is a difference between them, but it does not alter the fact that the *S. equi* can and does remain in the glands and follicles of the nasal mucous membrane of a certain percentage of recovered horses for a considerable time after recovery. They are harmless to such animals, because of the immunity conferred by the recent attack, and it is highly probable that some of these retain the streptococcus indefinitely and become "carriers" of the disease.

Infection.

There are three ways to be considered by which an animal may become infected: (1) By inhalation, (2) by direct contact, (3) by ingestion.

As the upper air passages are more often affected than any other part of the body it might be thought that inhalation would be one of the principal channels of infection. It would necessitate the organism entering the body in a desiccated state. Recent research has shown that this method of infection in other diseases of the air passages is very uncertain, and as *S. equi* is no exception to the influence of desiccation, one may safely conclude that, although possible, it is unusual for the disease to be transmitted in this way.

Mammary strangles transmitted to the dam by a sucking foal is a good example of transmission by actual contact, as is also genital strangles of the mare transmitted by an infected stallion trying a mare.

There is abundant clinical evidence in favour of ingestion being by far the most common method of infection, and the irregular way in which the cases occur in an outbreak point to the watering-trough as being the intermediate channel of infection. In the best civil stables, and in those remount depôts where every horse has his own bucket, it is hardly ever seen. A striking example of this is the remount depôt at Melton Mowbray, where, out of 263 horses which joined from April 1, 1908, to March 31, 1909, only two developed the disease. One of these developed it within eight days of joining, the probability being that it had it in the incubative stage on arrival. From April 1, 1909, to March 31, 1910, out of 225 horses which joined there was not even one case of strangles. Although many of these horses were six years old or over, one-third of the number were four or five years of age. Most horses when drinking bury the mouth and nostrils in the water, so that small particles of nasal discharge which escape ordinary observation are easily deposited in the water. In examining water-troughs at which horses in apparent health have watered, flakes of mucus may be found which on microscopical examination will reveal streptococci and other organisms, and although I have not yet been able to establish the identity of all of them, there is no doubt about the presence of *S. equi*. When large numbers of young horses are collected together, as in fairs, dealers' stables and railway trucks, it is impossible to know how recently some of them may have recovered from the disease, and watering as they do out of the same buckets or troughs, it is an easy matter for infection to be spread amongst them.

The simple form of the disease, viz., that associated with nasal discharge, sore throat, and submaxillary or parotid abscess, is that which is most commonly seen in England. The malignant form is seen mostly where hygienic conditions are bad, and in establishments where large numbers of young horses are kept together. We are more fortunate than our military colleagues on the Continent in this respect, in having a much milder form of the disease to deal with. Continental horse management is different to ours, and may, in some degree, contribute to this.

In a Continental Army with which I am familiar the remounts are bought at three and four years af age, and remain at the depôts until they are five years of age, when they are issued to regiments. This

necessitates the keeping of some 300 or 350 horses together for about a year. It affords unique opportunities for making observations on the course of an outbreak, reference to which is both interesting and instructive, especially if at some future time we adopt a similar system in England.

In the army to which I refer remounts are bought at fairs or at previously arranged centres in breeding districts; purchasing begins in October and goes on till June. After purchase they are sent by train to the depôts, where they are turned out to graze. The first part of the procedure entails irregular watering and feeding, possibly a railway journey to the fair and another to the remount depôt, and a good deal of standing about, all of which predispose to the disease. The result is, that some arrive at the depôts clinically affected, and many of the others develop the disease shortly after arrival.

The largest numbers are bought during December, January, and February, so that batches are continually arriving. Atmospheric variations at this time are frequent, and the horses feel the effects of these journeys and changes more than at other times. Grazing is scarce, which necessitates feeding the horses in sheds, where they huddle together for protection against wind and rain. Cases now become numerous, and it is at this time that malignant forms of the disease are mostly seen. With the improvement of the weather and the increase in the grazing, the horses leave the sheds for the open fields, with the result that there is an enormous drop in the percentage of sick, and by the beginning of summer the outbreak is practically over. This is the usual evolution of the disease at the Continental remount depôt I have in my mind, but there are occasional years, more especially when the winter has been a very mild one, when the disease is at its height as late as May or June.

The above system is conducive to most horses passing through the disease before their issue to regiments, but whether it is an advantage or not is doubtful. The high percentage of malignant cases, the mortality, and the number which are left unsound in the wind after the disease, are not in its favour.

The mortality varies from 0 to 3 per cent. When hygienic conditions are bad it is high. The deaths are mostly from malignant strangles, and more amongst young than old. On the Hungarian State Stud Farms, from 1886 to 1889, 1,711 foals, almost exclusively under 1 year, were attacked, of which forty-eight died, or 2·8 per cent. At the same time the disease was prevalent in the State Stallion depôt, and out of 118 stallions attacked there was only one case of malignant strangles which was destroyed.

In the Prussian cavalry the mortality varies in different years from 0 to 3·4 per cent. From 1900 to 1903, out of 3,954 remounts affected, eighty-two, or 2·1 per cent., died. In the Prussian remount depôt, from 1899 to 1906, out of 1,328 horses attacked, thirty-five, or 2·6 per cent., died.

In the French Army, from 1888 to 1897, out of 90,381 horses attacked, 992, or 1·1 per cent., died. From 1900 to 1901, out of an establishment of 100,000 horses, there were 18,165 cases and 283 (1·5 per cent.) deaths.

In the English Army over a period of years the average death-rate was 0·76 per cent.

SYMPTOMS: INCIDENCE.

The symptoms of strangles are so well known that there is no need to describe them here. There are one or two points, however, to which I propose to refer, as they will have to be considered in dealing with the prevention of the disease. There are two forms of the disease recognized in England—viz., simple and malignant strangles. To these should be added atypical strangles; it would include these forms of catarrh, sore throat, and catarrhal fever which are caused by the *Streptococcus equi.* Until recent years these diseases have been looked upon as being quite distinct from strangles; but, although laboratory methods and clinical observations have as yet failed to provide a distinguishing difference between the typical and atypical forms, there is abundant evidence to prove that the latter are often the beginning of the disease. Percivall [5] observed this, and in a paper read before the Central Veterinary Society last year, W. R. Davis [7] gave one or two good instances of catarrhal affections in old horses being the origin of the typical forms of the disease in young ones. Horses over 6 years of age and those having secondary attacks of the disease usually have it in the atypical form. It is best to consider any form of catarrh in a remount stable as specific, and more especially when some of the others have the disease in the ordinary form.

Out ot 930 remounts passing through Lusk remount depôt from 1906 to 1909, 82 (0·88 per cent.) had typical strangles, and 39 (0·41 per cent.) had symptoms of catarrh only; although the latter had to be entered on the sick returns as catarrh it is extremely probable that some of them were mild cases of strangles. It may be said with almost positive certainty that long-continued catarrh in young horses, especially the form known as catarrhal fever, is suppressed strangles; suppressed in the sense that there is no external abscess, but the

pharynx of such a case has abscesses in it which are the source of the discharge.

A natural attack of the disease confers a varying amount of immunity, the duration of which is difficult to ascertain. Humbert [2] records a four years' experience amongst horses over two years of age in which 2,195 had it once, 543 twice, and 121 three times, and 1,641 remained unaffected. It is not stated whether atypical forms of the disease are included, and as secondary attacks sometimes assume these forms, these figures may give an erroneous idea of the recurrence of the disease.

Preventive Measures.

Owing to the facility with which horses recover from strangles, and the slow and uncertain manner in which it spreads in the ordinary way, preventive measures are rarely adopted. The breeder does not look upon it seriously because very few die from it, and most animals on farms recover with no after effects. The sufferers are these who keep large numbers of young horses together, at the time when they are first put into work. Here the loss is more from depreciation of value from unsoundness in the wind following on the disease than from actual mortality. Serious as this loss is it is nearly always accepted as inevitable.

In making an organized effort to keep away the disease and to prevent its spread to others, the following measures should be adopted: All new arrivals should be quarantined for a fortnight before being allowed to join the other horses. The period of incubation being from three to eight days this would allow ample time for the disease to develop if they had it in the latent form.

Where only a few horses are kept this is a simple matter, but where horses arrive in fairly large numbers, as they do when joining regiments, it is not so easy, and special precautions have to be taken. The stables for their reception should be so constructed as to make it impossible for one horse to dip his nose into the manger of his neighbour or touch any of his neighbour's food. This can be effected by having a stall partition, or by the ring and sliding bar method of tying up, the collar chain never being more than 2 ft. 9 in. in length.

The bedding of all horses should, after the soiled parts are removed, be allowed to remain in the stalls, especially for the first fortnight. The system of taking it out of the stalls and allowing it to mix with the general supply of the stable is apt to spread other diseases as well as strangles. With strangles the danger is more from

eating infected bedding than from skin contact with it. For this reason peat moss would be preferable to straw.

As the bucket system of watering in regiments is out of the question on the score of expense, and the risk there would be of buckets getting mixed, a common watering-trough can be used, provided it is emptied and washed out after every watering parade; this would ensure that no unobservable discharge was left in the water.

Before each watering parade there should be a nose and throat inspection by the non-commissioned officer in charge, and an officer's inspection at least once a day. Ang horse with the slightest suspicion of nasal discharge should be prevented from watering at the common drinking trough, and reported to the veterinary officer in charge. Major F. Eassie, D.S.O., A.V.C., has devised a system, which is now adopted at Lusk remount depôt, by which all remounts out at grass go through a "crush" once daily without the trouble of being caught up. They receive a feed of corn once in the day, previous to which a bell is rung. This is the signal for them to come from all parts of the field and walk through the "crush" into a feeding paddock. A well-trained Non-Commissioned Officer stands at the end of the "crush," and secures and isolates any horse with nasal discharge. By making this daily inspection strangles has been kept well under control at Lusk.

Particular attention should be paid to the ventilation of the stable. Young horses cannot have too much fresh air. In addition to modifying most of the diseases they suffer from, it often keeps them robust enough to escape infection.

When cases have been diagnosed the stall should be evacuated and thoroughly disinfected, particular attention being paid to those parts which have been soiled by nasal or abscess discharge.

The bedding should be burnt, as well as any food which may have been left in the manger. In remount stables the disinfection of the whole stable is unnecessary in isolated cases, but when the disease has spread through most of the occupants it should be thoroughly disinfected before re-occupation. This can be thoroughly and effectually done by using a blow lamp on the walls, floors, and mangers, and afterwards applying a suitable disinfectant with a spray pump.

Immunization.

Artificial attempts at producing immunity have been many and varied. The Russian method is the oldest and at the same time the crudest. It consists in turning the animals into a deep pool for half an

hour, exposing them to cold winds. and giving them very cold water to drink. This gives the organism every chance of gaining access to the system, and the result is that the animals are got through the disease in the mild autumn weather and sufficient immunity is conferred to carry them through the very severe Russian winter, during which mortality is very high in the unprotected.

Jensen and Sand injected cultures intravenously, and found that, although they conferred protection against artificial nasal infection, they were dangerous on account of the phlebitis and local inflammation which they frequently set up.

Kitt, in 1906, injected two foals with 5 to 10 c.c. of killed serum bouillon culture and found that they afterwards resisted nasal and bowel infection.

Gabritchewski injected simultaneously concentrated bouillion cultures evaporated down to one-tenth their volume and sterilized with 0·5 per cent. carbolic acid. Six foals were inoculated and they afterwards withstood virulent cultures being rubbed into the nasal mucous membrane. They also showed higher resistance than the controls to 1·5 to 2 c.c. of virulent culture subcutaneously.

Baldrey [10] working on the lines laid down by Wright, vaccinated rabbits and found that they afterwards resisted subcutaneous inoculation of virulent cultures.

No practical method of immunization suitable for preventing the disease in large studs has yet been devised from either living or dead organisms. More encouraging results have been obtained from the serum of recovered or hyper-immunized horses.

Delvos used the serum of recovered horses for protection in 20 c.c. doses subcutaneously, and found that ninety-four horses so inoculated did not contract the disease and that sick animals receiving 30 to 40 c.c. repeatedly recovered in a very short time.

Rohrs found that with serum injection in the treatment of the disease there was less nasal discharge, not so much fever, and resorption of abscesses on the point of development. He employed it in 10 c.c. doses three times a day on the first, second, and third days.

Jacoulet noticed that fever was of shorter duration, complications and relapses less frequent, and that the patient got better sooner when treated with serum. A daily dose of 20 to 30 c.c. was given; 80 to 100 c.c. brought the disease to a standstill.

Dassonville and Wissocq [8] have shown that by injecting horses with progressively increasing doses of strangles streptococci a protective serum can be produced, which confers a passive immunity lasting

from four to six weeks. Their method of hyper-immunization consists of giving 2 c.c. doses of cultures subcutaneously and gradually working up to 100 c.c. doses intravenously. Twenty-five or more injections are necessary before the maximum dose can be given. They tried to convert the passive immunity into a permanent one by injecting cultures of the organism about the same time as the serum, but had to abandon the method on account of the severity of the local lesions. The French Army tried the Dassonville serum but did not adopt it for general use. Civil Veterinary Surgeons in and about Paris appear to have had remarkably good results from the serum.

Desoubry [12] at a recent meeting of the Société Centrale de Médecine Vétérinaire, records having successfully inoculated 650 animals between April 1, 1907, and May 31, 1909, at places where the disease ordinarily occurred; M. Desoubry's practice is mostly amongst thoroughbreds, and his plan is to give a 20 c.c. dose to all foals (*a*) at birth or shortly after, (*b*) at the time of weaning, (*c*) when they are sent to their training establishments, (*d*) when an outbreak occurs in a stud, to immunize those exposed to infection.

Poels, of Rotterdam, produces a serum by hyper-immunizing horses with weekly injections of virulent cultures, beginning with 1 c.c. and increasing the dose gradually up to 20 c.c. After a total of 100 c.c. has been injected the serum is rich enough in protective substances to be used in immunizing horses. The dose of the serum is 10 c.c.

Jess, Piorkowski, Hoecht and Gantz, in Germany, have also produced protective sera which have found favour with some and not with others.

The reason why serum inoculation against the disease has not been generally adopted is partly because of the high price of the serum and partly because of the immunity produced is not a permanent one. There are occasions, however, when a temporary immunity can be utilised to great advantage, and although it has not as yet found much favour in England it has been put to good practical use in other countries.

The duration of the immunity conferred by serum is not exactly known. With most other diseases it begins to decline after the tenth day and has disappeared by the end of the third week. It has been pointed out by Bassett [13] that in the case of a homologous serum, viz., that used on an animal of the same species as that from which it has been prepared, the immunity is twice as long as that conferred by a heterologous serum, viz., that prepared from an animal of a different species. In the first case it is said to be three or four weeks and in the second about twelve days.

The size of the dose also, has, no doubt, some relation to the duration of the immunity. In France a larger initial dose is injected in preference to repeated small doses. Their reason for doing so is, that recent researches have shown that when anti-bodies, which are the protective agents in anti-sera, are injected into animals, they provoke the formation of corresponding anti-bodies. Secondary doses are neutralized more quickly than the first, so that there is a smaller production of anti-bodies and a corresponding shorter period of immunity conferred.

For most practical purposes in the Army one initial dose of 20 c.c. would perhaps be better than repeated small doses, but this is a point which only practical experience can decide.

In the service the time that remounts most require protection is (1) when they are bought; (2) on transfer from a remount depôt to a unit; (3) on transfer from the remount stable to a squadron stable. On all these occasions there is a lowering of vitality and a temporary breakdown of an animal's resistive power, which, providing the streptococcus is about, is conducive to the development of the disease.

I regret that I am not in a position to give exact statistics on the preventive value of serum in the English Army, but I am sure I am safe in saying that the immunity conferred may be compared with that acquired by an attack of the disease. It may not be quite so marked, but it is better in that the disease often leave after-effects, in addition to immunity, which seriously depreciate an animal's value. Secondary attacks in unprotected horses are mostly in the atypical form of the disease, and it has been observed that when serumized horses do get the disease, it is usually in this or a correspondingly mild form. Further, the dreaded after-effects are seldom seen in serumized horses. Of sixty-nine protected remounts in the Aldershot command only one was found to be unsound in the wind when examined after convalescence. This one had never shown any symptoms of strangles or catarrh, so it is reasonable to conclude that it was due to some other cause. Compared with the above, nine out of eighteen unprotected remounts were in various stages of wind unsoundness. This is a very high percentage, as ordinarily only 20 to 25 per cent. are left unsound in the wind, but even this is far too high, and anything which reduces it warrants its use till something is discovered which will give permanent and absolute protection against the disease.

We have not had the excellent curative results which some of our

continental *confrères* have experienced, but in many cases treated, serum seemed to modify the attack and the progress of the disease; animals became brighter, the character of the nasal and abscess discharge changed, and in some instances throat swellings, which in ordinary cases we would expect to develop into abscesses, gradually subsided without abscess formation.

It does not follow that because horses have been inoculated against the disease, disinfection and other hygienic rules should not be observed. It is only by using a combination of both that any real benefit will result.

Palliative Treatment.

Strangles being a specific disease and running a definite course, treatment is essentially palliative. Too much stress cannot be laid on a good supply of pure air. It is well known that animals turned out to grass seldom get the disease in a severe form, and usually recover without complications or after-effects, whereas the reverse is the case when animals are kept in large numbers indoors. In the Service the animal is usually put in a box in the hospital, but sometimes, owing to the large number affected, they have to be kept in stalls. Personally I would prefer to see them picketed in the open at any time of the year, if boxes were not available. Recovery would be much quicker, and complications and after-effects much more rare if this were adopted.

Food should be of the laxative type, and easily digestive. There is nothing better than an abundance of green food when it is in season, which, in addition to being laxative, cooling, and easily digested, assists in eliminating the toxins from the system by reason of its laxative and diuretic properties. All food should for preference be given off the ground to allow nasal discharge to drain freely away, and it is better to put it in small quantities round the box than in one place, so as to avoid it being contaminated by the discharge. When the throat is very sore, the food sometimes collects and ferments in the back part of the mouth and pharynx through the horse being afraid to swallow. In all cases when dysphagia is pronounced it is better, for this reason, to withhold all solid food, and to rely on gruel, milk, linseed tea, and even water till the symptoms are relieved.

Water is best given in separate buckets, and frequently changed, as it soon gets filthy from the nasal discharge. When the throat is very sore it should have the chill taken off to prevent paroxyms of coughing coming on. For all ordinary purposes, however, cold water is best.

Steaming gives relief when there are internal throat abscesses and when there is excessive nasal discharge, Washing the nostrils and smearing them with vaseline facilitates the flow of the discharge, and prevents it from collecting around the nostrils. Details such as these would come under the heading of good nursing, and are very essential in all severe forms of the disease.

Medicinally very little is required. Salts of potash in the drinking water and electuaries to relieve soreness of the throat are the most frequent remedies used. Clive Webb [11], found citric acid in one drachm doses dissolved in water, three times daily for three days, of the greatest value in relieving dyspnœa, and attributes its success to its action on the coagulability of the blood. It encourages the transudation of lymph and thereby aids bacterial defence; at the same time toxins are more readily carried away by reason of the increased circulation in the diseased parts.

Local treatment has for its object the ripening of abscesses and the evacuation of pus. There are several ways of attaining this, blisters and liniments of various kinds, poultices, fomenting, &c., but the best method in my hands has been the application of dry heat. This is obtained by packing the throat with dry tow or wool and retaining it there with a special hood. It has the advantage of being labour-saving—a great consideration when treating large numbers of animals—continuous in action and therefore quicker than any other method. All that is required is daily adjustment of the packing material, which can be done at the time of the daily inspection. When the abscess bursts, which it does after two or three days, the tow is replaced daily after cleansing the parts till the wound heals. Local surgical interference is seldom necessary.

In all cases of strangles there is a varying amount of prostration, and in some a loss of condition, from which recovery, particularly in young animals, is slow. In acute cases the period of convalescence is exceptionally long. To appreciate this fully one should ride the same horse before and after the disease, and note the want of vitality in the movements and the rapidity with which they tire, long after all outward symptoms have disappeared. There never should be any hurry about returning horses to duty after recovery, for in addition to the danger of their being carriers of the disease, there is serious risk of joint disease supervening on even the most ordinary work, and if there are any suspicions of the wind being affected it is a sure way of firmly establishing it. An ideal way of dealing with horses after recovery is to give them a run at grass, but this is not always

possible, so one has to make the best of things by advising suitable food, the lightest of exercise and strict attention to hygiene.

VACCINE THERAPY.

Encouraged by the hopeful results of vaccine therapy in abortion of cattle, I have made a vaccine on similar lines, and used it with most encouraging results in the treatment of the disease. After isolating and fortifying streptococci from strangles pus, by passing them through white mice and growing them on inspissated blood serum at 37° C. for twenty-four hours, large flasks (500 c.c.) of 10 per cent. serum bouillon are inoculated and incubated for one month. Six per cent. sterilized glycerine is now added, after which it is exposed in an incubator at 60° C. for two days over unslaked lime. This kills the organism and causes evaporation of the culture down to a thick paste, which is dissolved in half per cent. carbolic acid and sterilized distilled water, and brought up to half its original bulk, which makes it thin enough to pass through an ordinary hypodermic needle. It is now run into 5 c.c. sterile tubes, hermetically sealed and stored ready for use. This material which I have called *Strangline*, was injected subcutaneously into healthy animals in doses varying from 1 to 10 c.c.

The horses receiving the maximum dose had a large local reaction lasting four to five days, and a thermal reaction lasting two days, so it was decided to use it in 5 c.c. to 10 c.c. doses in the treatment of the disease.

The following are a few examples of the cases treated :

CASE 1 (*Captain H. E. Gibbs' Case*).—Catarrhal fever (atypical strangles). Admitted March 4, 1910, with bilateral nasal discharge, impaired appetite, and a temperature which varied from 103° to 104°, up to March 7.

March 7,—Strangline 10 c.c. injected.

March 9.—Animal feeding better, and brighter. Nasal discharge visibly decreased.

March 10.—Strangline 10 c.c. injected.

March 11.—Nasal discharge of a watery nature.

March 17.—Animal completely recovered.

CASE 2 (*Captain H. E. Gibbs' Case*).—Chronic catarrh. Has been coughing and discharging from nostril since February 5. Various remedies have been tried with negative results.

March 20.—Strangline 5 c.c. injected.

March 23.—Discharge from nostrils and cough almost disappeared.

March 30.—No cough or discharge from nostrils. Discharged cured.

Case 3 (*Captain H. E. Gibbs' Case*).—Strangles. Admitted February 20, 1910, with bilateral abscesses and nasal discharge, and a temperature varying from 103° to 104°. Abscess ready to burst on March 7.

March 7.—Strangline 10 c.c. injected.

March 9.—Right submaxillary abscess burst. Nasal discharge visibly less. Temperature 101°.

March 10.—Left abscess burst. Nasal discharge ceased. Ten c.c. strangline injected.

March 15.—Abscess wounds nearly healed.

March 18—Another abscess forming left submaxillary region. Animal off feed. Nasal discharge recommenced. Strangline 10 c.c. injected.

March 22.—Nasal discharge much diminished and watery in character.

March 24.—Abscess burst.

March 26.—No nasal discharge.

April 2.—Abscess healed.

April 3.—Discharged cured.

Case 4 (*Captain H. E. Gibbs' Case*).—Irregular strangles. Admitted January 14, 1910. A severe case. Made no progress at all under ordinary treatment, and on February 10 the horse had sixteen abscesses discharging pus in the region of the throat, face and chest. He was feeding very indifferently and was much emaciated and very weak, so much so that it was decided to apply for a board to consider the advisability of destruction.

February 11.—Strangline 10 c.c. injected. Result: Discharge visibly diminished, animal brighter, and feeding better.

February 16.—Strangline 10 c.c. injected.

February 24.—Strangline 10 c.c. injected. Nasal discharge stopped, and all abscesses healed, except three small ones. Appetite excellent. Horse much brighter.

March 1.—Strangline 10 c.c. injected. All abscesses healed.

March 7.—Strangline 10 c.c. injected.

March 14.—Small abscess in temporo-maxillary region forms and burst on 15th.

March 18.—Abscess completely healed. Horse cured.

Case 5.—Irregular strangles. This horse was used for serum production, and developed an abscess in the jugular grove on December 9, 1909. This was opened on December 11. It never completely healed, and a second one developed on January 1, 1910. After it was opened all kinds of remedies were tried, but the abscess continued to discharge.

January 30.—Strangline 1 c.c. injected. No appreciable effect.

February 5.—Strangline 5 c.c. injected.

February 9.—Abscess healed and gave no further trouble. Discharged cured.

CASE 6 (*Captain A. J. Williams' Case*).—Irregular strangles, with temperature 105·2° F., submaxillary swelling, nasal discharge and sore throat. From February 11 to 16 the swelling extended to the temporo-maxillary articulation and to the face. Abscess opened on right side of the 16th, submaxillary abscess on 17th, temporo-maxillary and five small abscesses on 19th. At this time there were nineteen abscesses on various parts of the face and throat.

February 23.—Strangline 5 c.c.

February 25.—Abscesses much healthier and discharge less.

February 26.—Two fresh abscesses in right sub-parotid region, opened on 27th.

February 27.—Abscesses healing rapidly, very little discharge from them. Large sub-parotid abscess opened.

March 1.—Abscess above right eye opened. Strangline 5 cc. injected.

March 14.—All abscesses except two healed. A deep-seated abscess above right eye noticed. Strangline 5 cc. injected.

March 15.—Eye abscess burst.

March 22.—Symptoms of pneumonia.

March 26.—With exception of slight serous discharge from above right eye, all abscesses healed.

March 31.—Symptoms of hydrothorax noticed. Animal got gradually weaker, and died on April 5.

Post-mortem examination revealed extensive pleurisy and pneumonia, and a large mediastinal abscess containing one quart of pus.

CASE 7.—Irregular strangles. This horse was being hyper-immunized for serum production, and developed irregular strangles on December 6, 1909. Abscesses formed in the jugular furrow, the left parotid region, the near shoulder, the withers, the near buttock and the off stifle, and these either burst or were opened and the pus evacuated. The horse lost a lot of condition and became so weak that he was unable to stand and had to be put in slings.

January 31.—Strangline 10 c.c. injected.

February 4.—Jugular, wither, and thigh abscesses healed.

" 5.—Strangline 10 c.c. injected.

" 8.—Stifle and parotid abscesses healed.

February 14.—10 c.c. Strangline injected.		The shoulder abscess continued to discharge to the end, although the quantity then was infinitesimal.
" 18.—20 " " "		
" 24.—10 " " "		
" 28.—10 " " "		
March 4.—20 " " "		
" 8.— 8 " " "		
" 14.—10 " " "		

" 23.—As the horse was still unable to stand, he was destroyed on the recommendation of a board of Veterinary Officers.

Autopsy.—Extreme emaciation, a small deep-seated abscess with tissue necrosis on the near shoulder, a large deep-seated abscess in the near hind quarter, containing two quarts of fœtid inspissated pus. The left parotid gland was enlarged and indurated as the result of an abscess. Other organs healthy.

Strangline may be injected into the side of the neck or into the loose connective tissue in the pectoral region. I prefer the neck, as the local reaction can be seen better here. This varies in size from a pigeon's egg to one resembling positive mallein reaction in glanders. It disappears in the course of three or four days, and seldom gives any trouble. I am unable to say why it varies as it does.

Strangline has no appreciable effect on the temperature, which depends more on abscess formation than anything else in this disease.

Cases 4, 5, 6, and 7, are evidence of its value in the treatment of malignant forms of the disease. The life of Case 4 was undoubtedly saved by its use, whilst the others show that it exerts a healing influence on strangles abscesses far superior to any recognized form of treatment. On the other hand, Cases 6 and 7 indicate that it has no effect on the prevention of abscess formation or on their resorption.

The quantity and quality of the nasal discharge was altered in Cases 1, 2, and 3. This points to its value in the treatment of the atypical forms of the disease (so-called cases of catarrhal fever and sore throat) and protracted recoveries characterized by persistent nasal discharge, cough and general unthriftiness. As nasal discharge is one of the principal vehicles of the contagion, any remedy which reduces the quantity or gets rid of it quickly will materially help in preventing the spread of the disease. There is a further effect it is not unreasonable to hope for, viz., that horses so treated will not harbour the streptococcus in the nasal mucous membrane after recovery, and be a source of danger to others. Its action on the nasal discharge indicates that it might have a bactericidal action on the organism in this

situation, but only an extensive use of the vaccine and careful observation will settle this.

The above results were obtained from the first lot of vaccine made, and as they were so promising a much larger quantity was made the second time. Unfortunately, I had no shallow trays large enough for evaporating such a quantity down quickly, and instead of this process taking two or three days, it took over a week. This vaccine gave anything but good results, and had to be destroyed.

There is still much to be learned regarding the size and frequency of the dose, and it may be there are stages in the disease when it is not advisable to use a vaccine. Careful clinical observation will decide these points.

REFERENCES.

[1] NOCARD AND LECLAINCHE. "Les Maladies Microbiennes des Animaux," vol. i.

[2] HUTYRA AND MAREK. "Spezielle Pathologie und Therapie des Haustiere," vol. i.

[3] LAW. "Veterinary Medicine," vol. iv.

[4] FRIEDBERGER AND FRÖHNER. "Veterinary Pathology," vol. i.

[5] PERCIVALL. "Hippopathology," vol. i.

[6] CHAMPETIER ET PAYROU. "Étude sur la Gourme."

[7] DAVIS. *Veterinary News*, March 27, 1910.

[8] DASSONVILLE AND WISSOCQ. *Veterinary Record*, September, 2, 1905. VETERINARY JOURNAL, August 1907.

[9] SCHUTZ. *Journal of Comparative Pathology and Therapeutics*, vol. i.

[10] BALDREY. *Ibid.*, vol. xxi,, part ii.

[11] WEBB. *Ibid.*, vol. xxi., part ii.

[12] DESOUBERY. *Ibid.*, vol. xxii., part i.

[13] BASSET. *Ibid.*, vol. xxii., part i.

CONTAGIOUS GRANULAR VAGINITIS IN CATTLE, AND ITS RELATION TO STERILITY AND ABORTION.[1]

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THIS disease, peculiar to the ox, is essentially a catarrhal inflammation affecting the vulvo-vaginal mucous membrane in females, and the prepuce and glans penis in males.

The pathognomonic symptom is the presence of small nodes or granules; these are found in heifers and cows during the whole course of the disease; they have also been observed occasionally in bulls, while vesicular and ulcerous lesions are entirely absent.

[1] Read before the National Veterinary Association, London, July 27, 1910.

The causal agent is said to be a streptococcus, discovered by Ostertag, found in the deeper layers of the vaginal mucosa, and in the muco-purulent discharge. The irritation excited by the specific streptococcus is followed by swelling of the lymph follicles; these appear prominent on the surface of the mucous membrane in the form of numerous small, firm granules. The catarrh may remain localized in the vestibule and vagina; on the other hand, it may extend forward to the uterus. Untoward sequelæ are endometritis, pyometra, cystic degeneration of one or both ovaries, and hypertrophied corpora lutea. Abortion and sterility are therefore said to be frequently associated with virulent outbreaks of the disease.

In these days of the ubiquitous motor-car, the dairying industry invites the earnest attention of the veterinary profession. It is to our advantage to conserve the reproductive powers of the more valuable dairy and breeding animals, thereby continuing their usefulness as stock getters and milk producers.

Any disorder of the genital apparatus may result in serious economic loss, due to the diminished and irregular supply of milk, and the compulsory fattening of valuable deep-milking cows for the butcher. Acute vaginal catarrh is at present disseminated over wide areas in two continents, and the damage attributed to it is said to be greater than that caused by foot-and-mouth disease. Many European writers regard it as one of the worst scourges affecting dairy cattle. I therefore offer no apology for bringing the disease under the notice of members of The National Veterinary Association.

My attention was first drawn to the malady about a year ago, and since then I have had it under observation from a clinical standpoint. It has happened that a considerable number of dairy stock of all ages have passed through my hands while engaged in testing with tuberculin, and in the ordinary routine of practice. About 1,800 head of cattle have been available for examination, most of them periodically, and a record has been kept in various herds in regard to (1) age, (2) nature of the lesions, (3) sterility and abortion, (4) genital soundness.

Sixty per cent. of the females were affected with chronic vaginitis follicularis in varying degree; most of the animals were bred in Essex, while others were brought from different counties to be tested. Not a single case of the acute disease, as described by European writers, has presented itself.

The chronic form is admittedly a comparatively mild and insignifi-

cant affection, which, so far as my observations go, bears no distinct relation to sterility co-existing in the same animal. I fear, therefore, that little value can be attached to the data I have collected, unless they serve to draw more attention to sterility in general.

Synonyms.—Infectious vaginal catarrh, vaginitis verrucosa, chronic vaginitis follicularis, vaginitis et metritis follicularis infectiosa (Hess), granular venereal disease (Williams). Moussu [7] calls the vesicular venereal disease "Contagious vaginitis." To avoid confusion in nomenclature, it would be well to restrict the term "contagious" to the disease under consideration.

History.—Contagious granular vaginitis appears to have been first observed in Switzerland many years ago. In 1903, the Swiss Veterinary Surgeons' Society instituted a thorough investigation, and later on, under the able direction of Professor Hess, a report was published replete with valuable information and statistics relating to the extent and the ravages of the plague.

It is widely disseminated throughout various parts of Germany, and in other European countries it has attracted considerable attention for some years past. Williams [5] considers that the malady has probably existed in the United States for a quarter of a century, although it was apparently only recognized as a distinct disease two years ago. There are reports as to existence in Canada, and indeed it would appear to be widely distributed over the North American continent.

In this country the disease has received little or no attention, and no observations, so far as I am aware, have been recorded in our literature. This may be due to the fact that the acute vaginal and uterine inflammation is a rare complaint, although it prevails as a virulent epizootic and enzootic in other parts of the world.

Although details are lacking in regard to the incidence of the disease, it is reasonable to suppose that English cattle possess no immunity against the acute infective virus. Its non-recognition by English veterinarians may be ascribed to (1) the mild, chronic, and somewhat insidious course; (2) confusion with the vesicular disease known as "bull burnt or clap"; (3) the somewhat scant attention paid to sterility in cattle; (4) the prevalence of epizootic abortion due to Bang's bacillus.

Etiology.

In 1898, Ostertag claimed to have discovered the specific organism in a short streptococcus consisting of six to nine cocci, held together in a delicate capsule, and present in the purulent discharge and

in the deeper layers of the mucous membrane. He isolated the organism, grew it in pure culture, and produced the disease in heifers by inoculation.

It is interesting to note that swabs soaked in both mixed and pure cultures of other cocci associated with the streptococcus in the vaginal discharges gave negative results.

Ostertag went further than this; he pointed out that bacterial invasion of the uterus may take place, in which case the granules are found on the uterine mucous membrane, and the discharge from the uterus is rich in the streptococci. Ostertag's statements were confirmed by Hecker, Raebiger, Hess, and other investigators. Raebiger [8], who began his researches in 1900, considered that the streptococcus was the causal agent for the following reasons:—(1) It is always to be found in the diseased secretions; (2) Its artificial cultivations at once produced the typical catarrh; (3) The streptococci are always to be found in artifically-infected cows. The organism is said to be non-pathogenic for animals other than the ox. It stains well with Loeffler or methylene-blue, but is decolorized by Gram. It grows well at ordinary temperatures on glycerine-agar, urine-agar, and other media. While infection of the uterus is easy to understand, the fact remains that few authenticated cases have been recorded. In many cases of chronic metritis and pyometra, it is not at all clear that a specific organism, associated with granular lesions on the uterine mucosa, was present in the purulent discharge.

It is true various writers have reported isolated cases of uterine infection. It will, I think, be generally admitted that the diseases of the genital organs, more especially those of an infectious nature, require further investigation. The relation between the granular disease and epizootic abortion has not been proved, although many outbreaks on the continent and in America have been attributed to contagious granular vaginitis. Epizootic abortion is very largely due to the bacillus of Bang, which many European authorities have, so far, been slow to recognize.

Methods of Infection.—The malady is described as a venereal disease in that it is often transmitted by coition; other factors in spreading the infection are: Immediate contact (soiled tail, hind parts and channel); soiled fodder and litter, hands, boots, and clothes of attendants; grooming utensils (curry-comb), and infection from the mother during and after parturition. The quantity and virulence of the vaginal discharge are in direct proportion to the

intensity of the lesions. In young females, inoculation with virulent material is nearly always attended with positive results, the discharge is scooped up from the vagina of the diseased animal and rubbed on the mucosa of a healthy one, or sterile swabs of cotton wool on wire are used to convey the infection. Bulls and old cows are less susceptible to artificial infection, although bulls readily contract the disease by coition. I have examined large herds of cows without conveying the disease from one to another, although no precautions have been taken; in most cases the vulvar labia have been grasped with the thumb and fingers, but a wire dilator or a speculum has also been used with impunity, even in cases showing a slight discharge.

The chronic stage of the nodular disease is very seldom accompanied by a visible vulvar discharge; but it may occur after copulation. I have convinced myself that the common chronic form, unattended by redness, swelling, or increased secretion, may be regarded as non-infectious. Hess's [3] observations on this point are very important; he says that "the activity of the virus disappears with the onset of chronicity." In about 2 per cent. of cases unconnected with copulation I have observed a small quantity of pus on the vulvo-vaginal mucous membrane in the form of scanty greyish-white shreds or flakes; at other times a little pus has issued from the clitoris or has been squeezed out from below. This discharge has not, however, proved infective through the bull or in other ways, and the natural assumption is that it has no virulence.

Age.—The disease is most intense in young animals in all stages of the catarrh; they are also most susceptible to natural infection. Three-fourths of my cases have occurred amongst young cows and heifers, and a large number of young calves and virgin heifers have shown distinct granular lesions. In old cows, the nodules are usually blanched and few in number, or absent altogether.

Doubtless, the tough (pale yellow) condition of the genital mucosa in old cows renders it less liable to infection: while there is a constant tendency on the part of the granules to shrink and fade away, resulting in spontaneous recovery, the process may take several years.

It is reasonable to assume that old cows may acquire immunity from one or several attacks of the acute disease.

Prevalence.—The disease has appeared in several countries in a severe enzootic and epizootic form. In East Prussia 30,000 cows are reported to have been affected in one year; in Switzerland, in

1903-1904, 60 per cent. of the cows and 48 per cent. of the bulls were found to be diseased. In other countries, in certain areas, it has not been possible to find a healthy herd of cows. In the mild chronic form of the malady it is common, in my experience, to find 80 per cent. of dairy cows showing distinct to very slight lesions.

Incubative Period.—This depends on the activity of the virus. Inflammatory phenomena begin to appear two to three days after artificial inoculation, three to five days after coition. Two to six days is the usual period. Hess puts the interval at twenty to seventy-two hours, but records one case in which a delay of eleven days occurred.

SYMPTOMS AND COURSE.

(1) *Acute Form.*—During the first forty-eight hours the disease cannot be distinguished from other forms of vaginitis. There is swelling of the vulvar labia, increased mucus, and considerable congestion and swelling of the vulvo-vaginal mucous membrane. The cow evinces pain on manipulation, urinates frequently and scantily, strains and arches her back a little, and shows uneasy movements of the tail and hind legs. Very soon the discharge becomes muco-purulent and more or less copious; it adheres to the tail and the tuft of hairs at the lower commissure, and it is found on the floor of the stall; it is always odourless. The sticky nature of the mucus causes the pus to cling to the mucosa in flaky shreds; hence, on opening up the vagina a whitish-grey shreddy coating is found lining the canal.

In about forty-eight hours numerous small, firm, round elevations appear in the vestibule in the region of the clitoris on the infero-lateral wall. These are the granules which are so characteristic of the disease in all its stages; they are always to be seen and felt under ordinary circumstances, and the diagnosis depends essentially on their presence. They present the following characters: rounded like mustard seeds, pin's head to a radish seed in size (millet size common), dark red in colour, solid, smooth surface, discrete, and often arranged in irregular parallel rows on the longitudinal ridges of the mucous membrane.

They spread upwards over the lateral walls till they meet near the superior vulvar commissure. Occasionally they spread forward to the os, and even to the uterus. The irritation and discharge bear a distinct relation to the number of granules and the area affected.

It is important to remember that no vesicles, pustules, or sores of any kind appear on the mucous membrane in uncomplicated cases. The constitutional symptoms are slight; there may be a little fever, and the milk yield is diminished. The fatality is nil. The acute stage lasts a month or less.

(2) *Sub-acute Form.*—The inflammation subsides and the discharge becomes slight and intermittent. Angry zones or areola still surround the nodules which are now bright red in colour. This stage may last two months.

(3) *Chronic Form.*—The chronic stage may be said to set in about three months after the commencement of the disease. Its duration is quite indefinite; there is no doubt that the lesions may and do persist for several years, though there is a constant tendency for the granules to dwindle and fade; they may disappear in a few months.

According to my observations the character of the lesions may vary considerably in the same individual at different periods. Again, the granular areas still persist in the great majority of the cows which were recognized as being diseased twelve months ago.

The symptoms are, practically, those of the acute form minus the inflammatory phenomena. Discharge and signs of irritation are usually absent, the granules, for the most part, retain their former character and situation; they are usually pale red in colour, and the surrounding mucosa is quite normal, or occasionally injected and slightly reddened. No catarrh is present. Later on the nodules become blanched or colourless, like little blisters and smaller in size. Not infrequently large blanched granules are met with on the upper wall close to the vulvar commissure. Different stages are met with in the same animal. The rowed arrangement is less constant after a time, and contiguous granules sometimes become confluent, forming elongated swellings in length from a canary seed up to $\frac{3}{8}$ in. Rounded swellings are also seen the size of a hemp seed to half a split pea on the surface.

The granules show little tendency to run together in calves and young heifers; in the latter they are often rather large, discrete, and bright red in colour. Occasionally they are heaped up round the clitoris like a raspberry. On the roof of the vulva the nodules are usually few in number, small, fade more or less rapidly, and are situate close to the upper commissure $\frac{1}{8}$ in. to $\frac{1}{4}$ in. from the cutaneous covering; inferiorly the mucosa is free and smooth for $\frac{1}{2}$ in. to $\frac{3}{4}$ in. from the margin of the labia.

It follows that the granular ring encircling the tube of the vulva

is considerably broader below than above, *i.e.*, the granules extend further forward infero-laterally. Below, the breadth is commonly 1½ in. in cows, above it is ½ in. One frequently finds a few small pin-head blanched granules near the upper commissure (less often two or three larger ones), and an area of discrete, bright or pale red mustard-seed-sized granules on each side and in front of the clitoris.

I have met with several cases in heifers in which the lesions reached the neighbourhood of the os uteri along the floor of the vagina, in one case only they had spread along the roof near the os, while inferiorly they barely reached the meatus. I am inclined to regard this condition as of rare occurrence in the chronic form of the disease. It is certainly the case that the nodules show a more marked tendency to spread forward in heifers than in older animals.

The colour of the mucous membrane varies greatly, it is often very pale or blanched in young calves, pale yellow in old cows, the yellowish tint being quite normal. A diffused or streaky redness is associated with extensive lesions.

Exacerbation occurs occasionally during pregnancy, more often at œstral periods, especially if copulation takes place. The irritation induced by coition is shown by (1) angry dark red colour of the granular area and surrounding mucosa and slight swelling; (2) excessive mucus; (3) occasional tearing at the upper commissure (heifers); (4) slight coating of shreddy pus or thick sticky mucus, or both. The slight signs of uneasiness, if present, are unnoticed by the cowmen, who remain in ignorance of the condition until it is pointed out to them. These untoward symptoms notwithstanding, the animal frequently proves in calf.

For some time before and after parturition and abortion, the swollen œdematous slimy condition of the genital canal and labia renders the detection of the granules difficult or impossible. The period varies from a few days to three weeks after parturition, and for two or three up to twelve weeks in primiparæ beforehand. The nodular elevations are partially or completely buried in the swollen mucosa, in spite of which they may be felt with the fingers or even seen occasionally on stretching the labia.

It follows that a definite diagnosis cannot always be made in down-calvers and in recently-calved cows.

Mention has been made of the fact that a small quantity of pus may now and then be squeezed out of the clitoris; this pus, however, possesses no virulence, it quickly disappears and its presence remains

undetected unless periodic examinations of affected animals are made. Lastly, petechiæ are very occasionally seen on the vulvo-vaginal mucous membrane at all ages from six or nine months upwards.

Cases of Chronic Granular Vaginitis Aggravated by Copulation.

Cow (*a*) aged 4. I examined her October 9, 1909, three weeks *post partum*. Numerous pale red nodules size of mustard seed arranged in rows and extending forwards for two inches infero-laterally; mucosa otherwise normal. December 21, 1909. Six days after first service, granules dark red and apparently increased in number, mucosa injected, especially upper wall; lot of mucus, slight coating of pus on mucous membrane, half teaspoonful squeezed from prepuce of clitoris which was swollen. Swabs sent away for experimental inoculation gave negative results: staphylococci and streptococci in cover glass preparations. Irritation disappeared within ten days; cow pregnant.

Cow (*b*), aged 3. Similar to (*a*) but granular area smaller before and less irritated after copulation. No pus from clitoris, no swelling; stood bull.

Cow (*c*), aged 6. Granular area, rather larger than (*a*), but more faded, several canary seed to half split-pea sized reddish elevations near clitoris. Vulva relaxed and moist. After copulation: granules increased, bright red in colour, surrounding mucosa congested and little swollen, increased mucus, no pus. This cow was sterile, right ovary cystic, size of pullet's egg, œstrum excessive and prolonged, periods regular, becoming shorter and irregular; broad ligaments relaxed, pronounced hollow right side; crushed cysts four times per vaginam, after which she became pregnant.

In both (*b*) and (*c*) the irritation produced by the bull quickly disappeared.

Bulls—The symptoms in bulls are comparatively mild, even in the acute form of the catarrh; granules are seldom to be detected on the glans penis. In Switzerland 48 per cent. of the bulls were diseased during 1903-1904, but only one-fourth of these showed acute symptoms; the others were chronically affected. Bulls are credited with transmitting the disease without showing any visible discharge or swelling.

A purulent catarrh of the prepuce is sometimes present, a little pus oozes from or may be pressed out of the sheath, it may adhere to and become dried on the long preputial hairs. Less frequently, the

purulent or muco-purulent discharge is abundant, the prepuce is swollen and very sensitive, and granules similar to those seen in cows are found on the glans penis. The animal may refuse to copulate, or the act is performed slowly and a little blood is noticed.

I have handled about sixty bulls in the course of my investigations, and in no single instance have I found lesions attributable to the granular disease. The great majority were healthy, two or three were affected with "clap," whilst others, mostly young bulls in use for the first time, showed warty growths on the penis, or injuries due to copulation. It must be admitted that the cursory examination made in some cases may have failed to reveal slight lesions in spite of the fact that observations were made in most instances before, during, and after coition.

Some of these bulls belonged to herds in which 80 per cent. of the cows and heifers were chronically affected, yet they continued to serve healthy and diseased alike without conveying the infection.

It would appear, therefore, that the symptoms in bulls in the chronic form are negative or very slight, and further, that this form of the malady is not venereal in the proper sense of the term.

The clinical diagnosis of a suspicious genital discharge in bulls may, in some instances, prove rather difficult; in cows, on the other hand, differentiation is usually quite simple.

The fact should be borne in mind that a profuse preputial purulent discharge in the bull is often due to a totally different disease, commonly termed "bull burnt." Like the granular disease, this affection is sometimes transmitted in other ways than by coition, and pregnant animals may become infected if brought in contact with the virulent discharge.

Differential Diagnosis.

The scanty literature at our disposal in regard to venereal diseases of cattle is regrettable in that it may lead to confusion in their differentiation. The literature is not only scanty, some of it, especially that of older writers, is positively misleading, *e.g.*, the etiology and differential symptoms of so-called bovine gonorrhœa have not received the attention they deserve.

It is highly important that the two infectious genital diseases, vesicular vaginitis or "cow-clap," and contagious granular vaginitis should be clearly distinguished. I am of opinion that the differential diagnosis in the cow is difficult only (1) during the first two or three days, before the pathognomonic granules appear in the latter disease;

(2) when both diseases affect the same animal simultaneously. My experience has been that they may easily co-exist in the same animal.

At one time [9] the idea gained ground that the granular areas on the vaginal mucous membrane were in reality the result of an acute (vesicular) vaginitis which had assumed a chronic form. This statement, the fallacy of which has been proved by clinical observation, shows the amount of confusion which has existed.

Vesicular Vaginitis.

Synonyms.—Eruptive or benign venereal disease, vesicular exanthema.

This is a mild and fairly common affection in cattle which cannot be distinguished from what is ordinarily known as gonorrhœa, bull-burnt, or cow-clap. Rightly or wrongly I have been accustomed to regard it as the form of gonorrhœa affecting cattle. A series of experimental inoculations on a large scale, with a sufficient number of controls, would afford valuable evidence for or against this hypothesis.

In my cases a distinct urethritis has been present in male animals, and in females the meatus has been frequently involved. The late Professor Walley in his lectures defined gonorrhœa as a specific urethritis in males or vaginitis in females, the positive symptom being the formation of a crop of pustules followed by ulcers on the mucosa.

In the vesicular disease the ejection of urine is distinctly irritating to the animal, it is voided very frequently in small quantities, the straining, arching of the back, elevation and whisking of the tail, together with the discharge of muco-pus from the urethra in bulls, all point to the urethra being involved in the inflammatory process. Accompanying the ordinary symptoms of vaginitis, there is at the outset a vesicular eruption on the mucosa; the vesicles, which are rarely observed in the natural infection, are rapidly followed by crops of pustules and slight superficial sores or ulcers. The genital canal is lined with a grayish-white flaky coating of slimy pus, beneath which the mucous membrane is intensely injected, angry-looking, and swollen. It bleeds readily on examination.

In bulls there is a purulent catarrh of the prepuce, or balanitis, associated with swelling, tenderness, stiffness, and more or less abundant discharge. The penis is also inflamed and ulcers may be observed. Copulation is distinctly painful and draws attention to the condition, there is usually some blood during the act.

Spontaneous and complete recovery often occurs in cows in about three weeks, though proper treatment is advisable to shorten the duration of the malady and to guard against its sequelæ. The inflammatory phenomena may disappear after a few days.

The vesicular disease resembles the acute granular disease in the following respects: (1) inflammatory phenomena; (2) incubative period; (5) method of infection; (4) one attack confers no immunity.

It differs in that (1) its duration is much shorter, granules never appear at any stage if the disease exists alone; (2) it is widely distributed in Great Britain, and it is said to be communicable to other animals by experimental inoculation, the granular affection is not. In a word the chronic course of the granular disease and the absence of pustules and ulcers serve to differentiate it.

Several outbreaks of the vesicular-gonorrhœal disease have come under my observation, in females especially they have been quite mild in character; the cows gave less milk for a few days, but most of those infected by coition proved in calf. There was very little rise in temperature. The bulls showed more fever, loss of appetite, and stiffness, and they did not recover so quickly, due, in my opinion, to the urethra being involved.

The following cases of the double infection are interesting:

CASES OF CHRONIC GRANULAR DISEASE INFECTED WITH "CLAP."

Herd A, consisting of fifty-seven dairy cows and heifers (1st calf), and two bulls. One of the bulls was young, and had not yet come into use. The herd had been under observation for eight months for granular disease: twenty-nine of the younger animals, average age 4 years, were rather extensively affected, others showed slight lesions, some very slight indeed. Total number affected, 70 per cent. Examined February 26, 1910, found old bull and three cows with swollen genitals, and a muco-purulent discharge.

Cow (1). Aged 5. Bulled 21st, swelled 24th, discharged 25th, on the 26th vulva much swollen and œdematous, egg-cupfull of yellowish-white slimy pus in channel behind cow. Granules rather obscured by discharge and swollen congested condition of mucous membrane, only to reappear as prominent as ever as the inflammation quickly abated. Raw ulcerated condition of patches of the mucosa, covered with shreddy pus, and bleeds readily. The granular area before the fresh infection covered most of the vulvar mucous membrane and extended half way towards the os uteri along the floor of the vagina. She was temporarily sterile, due to cysts in right ovary; œstrum was excessive (mild nymphomania) and irregular. The cysts

were crushed some three weeks later, the operation being repeated for the third time in twenty-eight days. At the second subsequent (normal) œstrum she went to bull, and became pregnant.

Cow (2). Aged 3. Granules mostly bright red in colour and size of mustard seed, confined to vestibule. Bulled 25th. On 26th mucosa little hyperæmic, excess of mucus. On 27th, labia little swollen, granules quite distinct, signs of irritation during micturition. 29th, symptoms as above, but less acute. This heifer calved six months ago, and had not been in œstrum; previous examination had disclosed two yellow bodies the size of a winter bean in the left ovary. These were pressed out per vaginam in three weeks' time, with the result that œstrum appeared within ten days. The corpora formed again, but did not recur after a second operation; normal œstrum and conception occurred in twenty-one days after first heat.

Cow (3). Aged 2½. Three months calved, previous examinations showed her to be free of chronic granular vaginitis, hence she may be regarded as a control. Bulled February 23, 1910. Examined 26th. Characteristic symptoms, already noted, of vesicular disease present, most acute sixth day. No granules present before or afterwards. The genital canal was covered with dirty-white pus almost like a false membrane, beneath which the mucosa was intensely congested and ulcerated. Pain in micturition was shown by dribbling of urine, straining, paddling of hind legs, elevation and uneasy movements of the tail. The internal genitalia of this heifer were normal, and she conceived at the first service in spite of the infection.

Bull. Examined 26th. Showed marked symptoms, already described, of inflammation of prepuce and penis, with ulceration. Temperature 103·6. Appetite rather poor, thin yellowish discharge becoming thick and nearly white or creamy. Painful micturition. This bull had served six other cows previous to infecting No. 1. On the 19th he had two cows, one belonged to the herd and was rather severely affected with chronic granular disease prior to copulation; the genital mucosa was a little injected and moist for some days afterwards, nevertheless, she proved in calf. The other cow was a strange one from a distance. There is little doubt she brought the infection on the farm, though I was unable to verify the fact.

I was able to keep the cows under observation without adopting any treatment; the bull, however, had the sheath irrigated twice daily with ¾ per cent. of bacillol, and pessaries containing 6 per cent. bacillol were inserted every night. He was shown a cow in season after four weeks, at which time he seemed all right. Two weeks later he was used with impunity.

Remarks.—Before seeing cow (3) and making a careful examination of the bull, I came to the conclusion that I had at last come across a genuine outbreak of acute granular vaginitis. It seemed to me that the home cow served on the 19th had infected the bull acutely. The ulcerated condition of the bull's penis, together with the absence of granular lesions in cow No. (3), showed this hastily-formed opinion to be erroneous. I might mention, also, that whilst engaged in testing this herd for tuberculosis I conveyed the infection from the bull to a genitally-sound cow and to a heifer; both contracted the vesicular disease like No. (3) but in a milder form. Recovery occurred in a few days. The heifer was pregnant and carried her calf the full term. Other outbreaks of the vesicular-gonorrhœal disease have occurred on other farms at somewhat long intervals during the last few years. The same observations apply to them except that the granular lesions, if present, were not looked for and were not observed. In one large farm (ninety-four cows) the same bull served seven cows at intervals of a day or two and infected every one of them. They all proved to be pregnant. Lysol in ½ per cent. solution was used to irrigate the parts.

Therapeutics.

Contagious granular vaginitis is to be handled as an infectious disease on the usual lines, disinfection and isolation being essential for its control and eradication. The earlier stages of the malady call for curative and prophylactic measures somewhat similar to those recommended for epizootic abortion: (1) antiseptic irrigations of all animals, diseased and healthy; (2) cleansing and disinfection of the external genitals, tail and hind quarters; (3) disinfection of the cowsheds or other infected buildings, especially floors and gutters or channels; (4) isolation of diseased, suspected, or newly-arrived animals; (5) cessation from breeding for a reasonable time, six to eight weeks (three months after abortion).

The later or chronic stages do not appear to require any treatment. Raebiger [8] carried out classic experiments from 1900 to 1906; after exhaustive investigations he found that a creosote preparation named bacillol most nearly fulfilled the requirements of a reliable, cheap, and (comparatively) non-irritating antiseptic for irrigation purposes. A 1½ per cent. solution killed the streptococci in one minute, while strong solutions proved less toxic than other preparations. Personally, I have used bacillol largely in ¾ per cent. solution for both vaginal and uterine irrigation with excellent results. Lysol

is more soapy in character, and is to be preferred, but it is too expensive for general use. Two per cent. solutions of these disinfectants, together with creolin and a host of coal-tar derivatives, are too strong for tender, sensitive genital mucous membranes, both male and female; I have repeatedly observed, more especially in young animals, irritation and straining with tendency to adhesions or stricture from solutions of this strength employed twice daily for two or three weeks. Williams' [5] researches emphasize this fact, and show that irritation produced in this way interferes considerably with subsequent more rational treatment. The harm sometimes done by strong injections is also referred to by Hess [3A].

In dealing with a small number of cows, thorough flushing out of the vagina is most conveniently effected by means of a hard metal syringe holding about 1 quart, strongly made for rough usage, the nozzle or injection pipe 6 in. long, and thick to avoid injury to the vagina or os from careless holding, the distal end slightly bulbous and pierced with numerous holes so as to produce a fine spray in every direction without too much force. For bulls, an extra long Higginson's enema or milk fever syringe with special metal nozzle, or the following appliances used for cows may be employed. Instead of the special vaginal syringe a gravity apparatus is used consisting of a large funnel, several feet of rubber tubing with a canula attached. A rubber tube 10 ft. in length $\frac{3}{8}$-in. bore and $\frac{3}{4}$-in. outside diameter is to be recommended for both vaginal and uterine irrigation used with a funnel, attached to any enema pump, a pail or tank fitted with a stopcock, or with a sufficiently large tube holder and suction plate to keep it down and prevent kinking. It is sometimes possible to suspend a large pail above and behind the cows and to pull it along the shed; this facilitates the work very much in large herds and economizes the cowmen's time.

The irrigations with mild warm solutions are carried out twice daily for a few days, then once daily, becoming less frequent after two to three weeks. After washing out the whole vaginal canal, bacillol ointment 6 to 10 per cent. is used once daily for a time in capsule or pencil form; the pessary is best introduced as far as possible with the fingers. This is Ritzer's method of using the ointment; Raebiger has invented a special ointment syringe for the purpose. The pencils are cheapest and they give good results in other vaginal affections.

It is highly necessary to prevent the animals copulating till all inflammatory phenomena have disappeared, and for a short time afterwards, roughly six weeks. The irritation sometimes produced

by coition, even in the chronic cases, has already been alluded to. Recovery is retarded, and infection may be conveyed in this way. It is good practice to syringe out the vagina with a 1 per cent. solution of bicarbonate of soda before going to bull, in case an acid or neutral state of the mucus exists; the reaction should be feebly alkaline, and various conditions of the genital tract may alter this.

Little more need be said in regard to prophylaxis. If the sound animals are few in number, and other premises are not available, they should occupy stalls apart from the other cows to which the drainage does not flow, *e.g.*, at the higher end of the shed. The sound cows should be dressed first, and all fresh arrivals disinfected and kept under observation. A garden syringe is useful for spraying the hind parts after cleansing the soiled vulva and tail.

It is worthy of note that recovery is not necessarily associated with the disappearance of the granules, though they often do disappear if prompt and rational treatment is adopted. If they persist they are small, blanched, and probably few in number.

As an experiment, I applied the bacillol treatment to one rather severely-affected herd for four weeks as follows:—

First week.—Daily injections $\frac{3}{4}$ per cent. solution and pencil ointment 6 per cent.

Second week.—Daily injections, pencils every second day.

Third week.—Injections and pencils three times per week.

Fourth week.—Two injections only.

Result.—No irritation, distinct fading (loss of bright red colour), of granules in a number of young cows, probably fewer in number. The older cows showed little alteration.

Sequelæ of Granular Vaginitis—Abortion and Sterility.

We have seen that the disease in the individual is comparatively mild, attended with little constitutional disturbance, and of short duration in the acute stage. Its results, however, according to European investigators, are very serious indeed. Many careful observations have been made, particularly by Hess, whose excellent work deserves all praise. It is held that serious economic loss is produced by the extension of the catarrh to the uterus, and that both sterility and abortion are common in severely-affected herds. That an infective lesion in one part of the genital canal may extend to another by continuity will be readily admitted, at the same time the number of the uterine infections is not stated, and some writers seem to attribute almost every disease of the genital tract to this

malady. Their facts are beyond dispute, the deductions drawn from these facts are, perhaps, open to criticism.

My point is that the granular affection in the virulent form has a place, and an important place, in the production of sterility, and it may be abortion, but the tendency is to magnify its importance as an etiological factor. Hess [3] states the case very fairly when he says: "It is not a matter of doubt that lack of desire and impotence, as well as some ovarian and uterine diseases, a cystic degeneration of the ovaries, mortification and maceration of the fœtus, abortion, chronic catarrhal and purulent endometritis, occur equally in infected and non-infected genital organs, and declare themselves by quite similar symptoms, on which account their etiological significance is at times surrounded with great difficulty."

ABORTION.

The relative importance of contagious granular vaginitis in the production of abortion has been variously estimated, and probably over-estimated. It is certainly the case that a purulent catarrh of the uterus, secondary to specific lesions in the vagina, or dating from the last parturition, destroys the intimate union which exists between mother and fœtus, and causes the latter to be expelled as a foreign body.

Invasion of the uterus is most likely to occur during œstrum through the open cervical canal: if impregnation takes places abortion will very probably take place during the first few weeks of pregnancy. An endometritis may already exist, and conception may possibly take place, in which case the fertilized ovum is unlikely to have a long intra-uterine life.

In discussing the etiology of granular vaginitis, I ventured the statement that the number of authenticated cases recorded of granular uterine infection is small, it now appears that the number of abortions attributed to it is very large. Many European writers are, or have been, of opinion that it is responsible for much of the abortion which prevails in an epizootic form. If the nodular disease is mild, the latter is small or *nil*; on the other hand, if the nodular disease is severe, it is credited with producing all the abortion in the affected herds amounting to 20 to 70 per cent. of the total number of cows. At the same time it is admitted that in other severely-affected herds no abortions at all have occurred.

One is struck by the lack of information in regard to other possible causes. To establish the above hypothesis it seems to me that three

things are necessary: (1) General recognition by bacteriologists of Ostertag's streptococcus or some other organism as the causal agent; (2) the demonstration of the specific organism and the granules in the uterus; (3) the transmission of the disease to the other animals by experimental inoculation.

It is hardly necessary to say before a gathering of English Veterinarians that by far the largest number of abortions in this country are due to Bang's bacillus of cattle abortion. The identity of the English and Danish disease has been established by the Departmental Committee of the Board of Agriculture. It is natural to suppose, therefore, that much of the epizootic abortion which prevails on the Continent and in America may be due to the bacillus of Bang, in spite of the fact that this organism has so far received scant attention as an etiological factor.

In my own practice I have kept a record of 300 consecutive cases of abortion: 80 per cent. of these have been clearly due to Bang's bacillus, judging by (1) character of the exudate; (2) microscopic examination of fœtal cotyledons; (3) appearance of the after-birth; (4) history and number of cases in the herd. The average period of gestation was six to six and a half months, and the average age four and a half years. All these cows were sent to isolation farms, most of them when they were showing premonitory symptoms, and their arrival was notified to me in every instance.

It is a well-known fact that epizootic abortion (Bang) is largely a disease of heifers and young cows, the same applies to the abortion produced by the granular disease. The latter, however, occurs at any period, often within twelve weeks of fecundation, whereas most cases of epizootic abortion occur between the fifth and seventh months of pregnancy.

I have not found severe granular lesions in slipped cows or heifers, although a number of these have been examined at various periods both before and after the act of abortion. On the contrary, the signs of chronic granular vaginitis have been comparatively slight and insignificant, although a chronic purulent endometritis leading to temporary sterility has been a common sequel of the abortion. Moreover, I have not found any relation between the extent of the lesions and the number of abortions, in either freshly-infected or older-infected herds.

Sterility.

It is generally accepted that sterility stands in intimate relation to the evolution of the milch cow and the forcing methods adopted

at the present day. It certainly appears to be on the increase in this country.

While sterility occurs without infection of the genital organs, it is considered to be closely related to and to follow severe attacks of contagious granular vaginitis. Many European investigators and writers agree on this point—*e.g.*, Zschokke, Raebiger, Hess, Hutyra and Marek, Neilson, Ostertag and Thoms. Their observations and statistics show that a much larger number of ovarian and uterine diseases are met with in severely-infected herds; and further, that the number of sterile animals affected with granular disease is considerably greater than the number of non-infected animals.

At the Ninth International Veterinary Congress at the Hague on September 19, 1909, Hess [13] stated that so far as his observations went, out of every 100 cases of sterility in cows, fifty-eight were due to this disease. He [3] points to infected herds in which the pregnancy figure is only 20 per cent. Hess also considers that apart from the extension of the catarrh to the uterus, the protracted hyperæsthesia of the posterior genital tract in itself hinders conception.

In other words, a chronic irritation at one end of the genital canal is said to inhibit ovulation and fertilization at the other, or to produce a definite pathological lesion such as a cyst or an enlarged corpus luteum in the ovary. It is difficult to understand how this may happen. If the vaginal mucus gave an acid reaction non-conception would be easily explainable, but this apparently is not the case.

The diseases of the genital organs attributed to the granular catarrh need not detain us here, and I propose to do little more than enumerate those most frequently met with: ovarian cysts, persistent or hypertrophied corpora lutea, occlusion or thickening of the oviducts, metritis and endometritis in various forms without pyometra; thickening, occlusior, and alteration in shape of the cervix. These diseases produce sterility in various ways, many of them are the direct result of normal parturition, or abortion with retained placenta, or faulty involution of the uterus. If conception occurs, death and maceration of the fœtus may ensue, followed by a muco-purulent discharge, and possibly abortion or pyometra; on the other hand, the fœtus is sometimes carried full-time or over-time. Abnormal œstrum usually accompanies sterility, there is extra heat or very slight œstrum, irregular periods, nymphomania, or absence of œstrum ("dumb bullers").

In Switzerland [11] a record was kept of 300 cows, in which the cause of sterility was definitely ascertained; 173, or 58 per cent.,

suffered from infectious granular catarrh (only eleven acutely), while 127 were free of the disease. Of the infectious cases, 75 per cent. of the 173 cows were between 3 and 6 years old; ninety-one, or 57 per cent., had diseased ovaries, either cystic degeneration, or hypertrophied yellow bodies; the remainder, eighty-two in number, gave the following results: Endometritis, forty-six (twenty-four due to abortion); pyometra, 21; absence of œstrum, six; acute granular lesions, eleven.

It is instructive to compare these figures with those pertaining to the 127 sterile cows unaffected with granular disease; 73 per cent. showed ovarian disease (against fifty-seven), and 62 per cent. of these had cysts (against forty-two).

Hess's observations show that, in Switzerland, at any rate, ovarian disease is common, and that it is primary; endometritis is not often associated with it.

Albrechtsen, on the other hand, takes the opposite view, both in regard to the relative frequency of uterine and ovarian diseases, and the influence of infectious vaginal catarrh on the genital organs. This observer lays stress on the frequency of uterine ailments as a cause of sterility; he regards the endometritis as primary and the cyst secondary. According to Albrechtsen [4], "infectious forms of vaginitis play a proportionately small *rôle* as causes of sterility in the cow; acute vaginitis, with severe symptoms, is rather easy to cure, and seldom causes sterility. Chronic vaginitis follicularis is a very harmless affection which bears no causal relation to coexistent sterility."

My own observations are confined to the mild chronic manifestation of the disease, which, as we have seen, is an insignificant and, comparatively speaking, harmless affection. I began my examinations in dairy herds in which the sterility figure, both relative and absolute, was high—10 to 20 per cent. Many of them were young animals, the ovaries were largely cystic, and granular lesions, usually more intense in the heifers, were present in 80 per cent. of the females. The internal genitalia of the non-pregnant animals in each herd, examined *per rectum*, revealed a considerable amount of disease, mostly in the ovaries and the uterus. In other herds, in which the vaginal mucosa alone was observed, the number of affected animals averaged 60 per cent., the lesions were, on the whole, very insignificant, and the sterility figure varied from 1 to 6 per cent.

These early examinations, together with a perusal of the literature on the subject, led me to believe that the prevalence of sterility in a herd bore a distinct relation to the intensity of the granular lesions, and to the percentage of animals affected.

Further observations in other herds and in other districts did not confirm this opinion, and at the present time I am not at all sure that the mild form of the disease has any appreciable effect on the reproductive organs. My case-book shows that forty-one cows, average age 5 years, have been handled for sterility during the past year, either operated upon *per rectum* and *per vaginam*, or treated medicinally, or both. Most of these were absolutely sterile, a small number was relatively so, having had the bull four or five times or more without proving in calf, or showing no œstrum for a long period. A number of others were merely examined, and afterwards fattened and sold. The forty-four females included twelve heifers (one calf).

The ovaries were affected in 55 per cent. of cases, occasionally accompanied by asymmetrical enlargement of the uterus (catarrhal endometritis). The interesting point here is that one-third of the animals showed no granules in the vagina; in the others the granular areas, excepting in some of the heifers, were faded and very slight indeed.

Turning my attention to calves and young heifers, I found a large proportion showing distinct nodules unaccompanied by irritation of the mucous membrane in almost every instance. The proportion of affected calves increased as age advanced, although the percentages varied considerably in different herds approximately the same age.

The method of infection was by no means clear, unless the fodder or bedding carried the virus; the stockmen did not enter the cowsheds, and in most instances the calves, after weaning, were kept on premises apart from the stock.

The following figures relate to 120 calves; they are rough averages:—

Two to three weeks to four months,	10 to 30 per cent. affected.
Four months	40 per cent.
Five to nine months	50 to 55 per cent.
Twelve to fourteen months	60 per cent.

Several hundred heifers, about 18 months, shortly before going to bull, have given a percentage of 65 to 70.

Cows and heifers after first calf, 80 per cent.

The lesions become less and less apparent as age advances, until, in old cows, they are either absent or very slight, small, and blanched. It follows that the disease affects large numbers of females, especially young females; it is chronic from the outset, and it apparently does little or no harm. The fact that the disease is present in heifers

before they go to bull is significant. In this connection Williams [5], who has done valuable work in America, states from personal observation that "sterility is very common and ruinous in herds where the disease is already present in the virgin heifers, and the basis for the sterility is laid prior to the coition." It is interesting to note that small ovarian cysts are not uncommon in virgin heifers that have never been bred, and I have found these to occur equally in infected and non-infected animals. In herds kept under observation, heifers after the first calf usually stood the bull the first or second time; the presence of granular lesions in the vagina did not affect conception to any appreciable extent.

In young heifers first time bred, sterility has been still more uncommon, although a case of nymphomania due to cystic ovary, or a "spurious pregnancy" due to pyometra, has occasionally occurred, nor has the so-called "invisible abortion" been at all common during the first few weeks of pregnancy, although at later periods in gestation epizootic abortion (Bang) has caused much havoc in some herds, up to 34 per cent. (12 out of 35 young heifers).

It must be remembered that the effects of the nodular disease may remain after the primary vaginal lesions have faded. Bearing this in mind, I have not been able to trace a higher percentage of subsequent sterility in young animals in which the vaginal lesions were extensive.

Twelve months is, of course, far too short a time in which to form a definite opinion based on personal observation. A series of extended observations in widely separated districts would furnish information of considerable value to breeders and to veterinary surgeons interested in sterility, particularly if statistics as to genital soundness were obtained by rectal examination.

I have made a systematic examination *per rectum* in a few herds to determine the relative frequency of disease in affected and non-affected animals. It was my original intention to submit these and other data here, they are, however, rather voluminous and hardly germane to this paper, inasmuch as they do not establish a causal relationship between sterility and abortion on the one hand, and chronic granular disease on the other.

In conclusion, I have to submit the following suggestion, "That the National Veterinary Association shall form a committee to ascertain if contagious granular vaginitis actually exists in a virulent form in this country, to note its effects, and to report to the next meeting." If the terms could be extended to include sterility in cattle. I feel sure valuable results would ensue.

LITERATURE CONSULTED—REFERENCES.

[1] HUTYRA AND MAREK. "Spezielle Pathologie und Therapie der Haustiere." Second Edition.

[2] Departmental Committee's Report (Board of Agriculture) on Epizootic Abortion. Part I. and Appendix, 1909.

[3] HESS. "Sterility of the Cow and its Relation to Infectious Diseases of the Genital Organs." Presented at the Hague, 1909. VETERINARY JOURNAL, February, 1910.

[3A] HESS. "The Sterility of Cows." *Schweizer Archiv. fur Tierheilkunde*, 1906.

[4] ALBRECHTSEN. "Sterility of the Cow and its Relation to Infectious Diseases of the Genital Organs."

[5] WILLIAMS, W. L. "Veterinary Obstetrics," 1909.

[6] YOUNG, W. J. "Diphtheritic Vaginitis in Cows." *Veterinary Record*, August 10, 1907.

[7] MOUSSU AND DOLLAR. "Diseases of Cattle, &c.," 1905.

[8] RAEBIGER. "Infectious Vaginal Catarrh in Cattle." *American Veterinary Review*, vol. xxxi., No. 1, 1907.

[9] FRIEDBERGER AND FROHNER. "Veterinary Pathology." Sixth Edition, 1908, vol. ii.

[10] LADANYI. "Infectious Vaginitis." *Veterinary Record*, July and August, 1907.

[11] Swiss Veterinary Surgeons' Society. "Report on Examinations conducted on the Nodular Disease," 1905.

[12] ZSCHOKKE, "Die Unfruchtbarkeit des Rindes," 1900.

[13] WOOLDRIDGE. "Report on Hague Conference, *Veterinary Record*, October 23, 1909.

THE TENDENCY OF ANIMALS TO DEGENERATE.

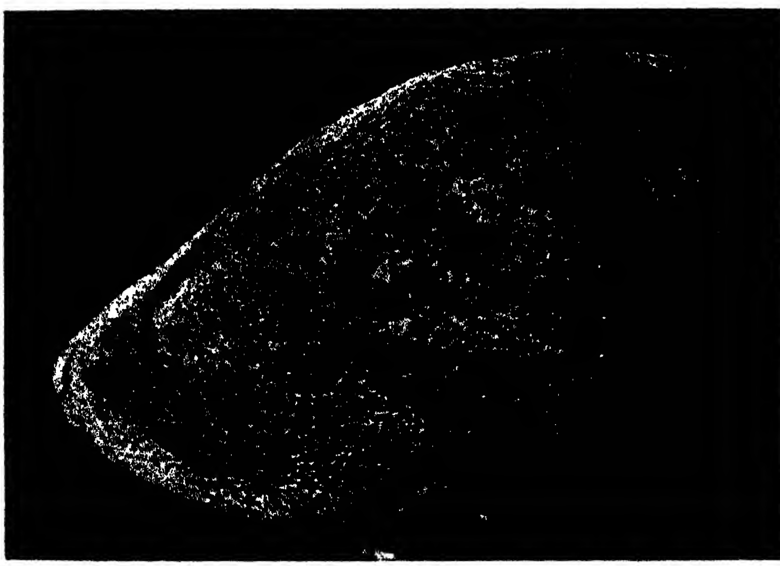
IN all improved breeds of live stock there is ever present a tendency to degenerate. This is a law of heredity, as these animals have been bred up from inferior original stock, and there is a constant inclination for the old original scrub blood, always to be found somewhere away back, even in the best pedigrees, to reassert itself. This tendency is only counteracted by the care of the stockman to meet it by the most careful selection of superior types on both sides. There is in this fact a thought for every breeder. Inferiority of any kind in breeding stock is a defect which has been inherited, and is, therefore, very apt to be transmitted. The only safe way to meet it is to study out where the faults of an animal are, and to meet them with a cross with another which is, in that particular, strong and good. If the breeding mare which you own has several weak points in her conformation, as most animals have, it is well to study them. Pick out the worst ones, and even if it cost you more money, mate her with a stallion which shows no tendency towards the same lack of excellence.—*The New Zealand Dairyman and Farmers' Union Journal.*

Clinical Articles.

AN UNIQUE SALIVARY CALCULUS.

By H. P. LEWIS, M.R.C.V.S.,
Chelmsford.

THE subject of this extraordinary calculus was a dark brown pony, about 16 years old and 14 hands high. The pony was brought to to me for advice about the "lump" on its jaw. I advised its removal, which met with the owner's consent. The pony was cast, and an incision about 6 in. long made into the sac containing the calculus, which was removed without difficulty. An examination of the sac



showed that this was formed by the distended salivary duct, which was supported on its lower border by fibrous tissue, about an inch in thickness. The wound healed in three weeks, and the pony worked for eighteen months in this district, when he was sold, and I lost sight of him. My chief reason for putting this case on record is, that I believe it to be the largest salivary calculus in existence: its dimensions are:—length 4¾ in., diameter 2¼ in., circumference 8½ in., weight 1 lb. 8½ oz. on removal.

AN ASIATIC BREEZE-FLY.

(*Tabanus albimedius*, Walker).

By A. W. NOEL PILLERS, M.R.C.V.S.,

Sheffield.

THROUGH the kindness of Captain J. J. Griffith, A.V.C., Bangalore, India, I am able to give an account of the above-named fly from a number of specimens recently received. The number of species in the genus *Tabanus* is so great that it would be impossible for an account of each species to be given in our standard books on veterinary parasitology. The fly in question, however, would appear to be so common in southern India and Ceylon that most veterinary surgeons must have come across it, although it is little mentioned as a harmful species. It is about 15 to 18 mm. long, and of a dirty-brown colour; the body is broad, with a large head, which is depressed from before to behind, the wings are extended horizontally, and provided with a great many nervures. The proboscis is short and thick, and the last article of the short antennæ is cresentic-shaped.

The fly is usually seen at the advent of the rains during May and June, or even earlier; the districts it seems to prefer may be described as woody, and natives say that it rests in the trees or roofs of the stables. It is said that the flies are most troublesome during the evenings, at dusk, or before a storm of rain. This is true of many flies. The Tamil name is "croothe," which means "big eyes," a prominent feature with all this group.

The animals attacked are horses, mules and oxen, and it enters the stables. The favourite site would appear to be the region between the knee and the fetlock on the outside. They do not remain long after alighting, because their mouth-parts are very sharp, and the animals soon seek to dislodge them by stamping violently. In this country the members of this group often alight on parts of the body where the skin is much thinner, and where they are less likely to be dislodged by the animal's head. Other parts attacked are the flanks and belly. As a result of the bite, the fly takes up some of the animal's blood, and, depending on the state of its proboscis, various changes may be brought about in the wound. Usually, however, a swelling about the diameter of a shilling results, and this gradually disappears. Sometimes, however, the animals bite the elevations, making them into sores, which the natives treat with a solution of salt in water. It is quite possible that the fly may transmit disease in a mechanical way.

ENDOTHELIOMATA IN A BULLOCK.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.
Melbourne University, Australia.

The case was brought under my observation at the Melbourne City Abattoir. The animal was an old working bullock, diagnosed as tubercular before slaughter. On *post mortem*, however, the naked-eye appearances of the lesions differing markedly from tubercle, the head and neck, to which the new growths were apparently confined, were retained for my examination.

In the space posterior to the angle of the right inferior maxilla was a large flattened, ovoid tumour measuring 6 in. in length, 4 in. in breadth, and about 2 in. in thickness. Attached to its postero-inferior border by a short pedicle was another walnut-sized tumour also flattened. So far as could be definitely determined the growth did not arise from any of the groups of glands in the vicinity; at all events there were normal lymphatic glands situated in the parotid, submaxillary, and retro-pharyngeal regions. The neck of the same side, however, showed four distinct tumours lying in line and corresponding to the lymphatic glands. The largest of these was the size of a large orange, and was situated about 4 in. below the first described growth. The others were of gradually decreasing size, that situated at the entrance of the chest cavity being about the size of a walnut.

The tumours were all definitely circumscribed. On section they were dense and almost fibrous. The cut surface exuded a small quantity of colloid-looking material; the appearance was greyish and fairly homogeneous, but many small fibrous trabeculæ could be observed infiltrating the tissue. Small hæmorrhages, near the periphery especially, were numerous.

Microscopical Appearances.—The new growths are composed of a stroma of dense fibrous tissue bands passing inwards from the capsule, branching and anastomosing to form alveoli of varying size. These alveoli are filled with large ovoid mucleated cells, well provided with cytoplasm. These cells have not on the one hand the characters of epithelium, and on the other are quite distinct from ordinary cells of lymphoid tissue. They are apparently endothelial in nature and origin. New blood-vessels are fairly numerous, and in the larger alveoli may be seen almost centrally situated, the lumina being large and the walls extremely thin. Many of the alveoli, particularly those near the periphery, contain recently extravasated

blood corpuscles lying free amongst the tumour cells. No areas of degeneration are present.

The new formation can hardly be included amongst the ordinary sarcomata, even the alveolar sarcomas. Although there was no naked-eye evidence that the largest tumour situated in the parotid region had originated in a group of lymph glands, it seems most probable that the origin was actually one of the small glands so numerous in that region, the endothelial cells having acquired the power of multiplying and producing a malignant new growth. The fibrous tissue new formation which is such a marked feature in sections can probably be best accounted for in the same way as the fibrous stroma of cancer. It generally appears quite distinct from the cells within the alveoli.

Unfortunately the viscera were destroyed before my arrival, so that an opportunity of carefully examining the lungs, spleen, &c., for metastases was lost.

ENDOTHELIOMA OF THE MEMBRANA NICTITANS IN A HORSE.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S.
Melbourne University, Australia.

THE membrana nictitans of a horse described in this note was received from Mr. J. B. Leitch, G.M.V.C., Veterinary Surgeon, Geelong.

The membrana showed two growths situated close together, ovoid in shape, flattened on the external and internal surfaces, one about ¾ in. long, the other somewhat smaller. The mucous membrane was not implicated. The borders were indistinct, gradually merging into what appeared to be healthy tissue.

Microscopical examination of sections disclosed an unusual form of new growth, the following being the general appearance:—

New blood-vessels are numerous. The bulk of the new growth consists of large epithelioid cells, chiefly distributed in more or less irregular groups, separated by, and here and there infiltrated with, smaller lymphoid cells possessing little or no cytoplasm. Each mass or group of larger cells is generally arranged around a new blood-vessel more or less centrally placed. In the smaller areas the wall of the new blood-vessel is extremely thin, and is composed simply of a layer of slightly flattened cells of the new growth. In the older and larger masses the blood-vessels are still seen to be composed of the

same kind of cell, with the exception that several circular layers of flattened cells form the vessel wall, these gradually merging into typical cells of the growth. The lymphoid cells are lying in an extremely fine network which forms a kind of stroma to the tumour.

The large cells which form the bulk of the new growth are oval, with spherical and oval nuclei surrounded by a considerable amount of cytoplasm, but showing no tendency to form any fibrous tissue.

The size of the large cells, the definite cytoplasm, and their intimate connection with the new blood-vessels, all point to their origin being the endothelium of the capillaries of the region, and that the tumour in question may be best included amongst the endotheliomata.

Mr. Leitch advises me that tumours of the membrana nictitans in horses having similar naked-eye characters and clinical history to that described are not uncommon, though much more uncommon than the papillomatous and carcinomatous growths with the typical soft, warty appearance. In this case the animal was an aged draught horse and the tumour had only been observed for five or six weeks prior to Mr. Leitch being called in and operating. The growth was smooth and not ulcerating, but was of a deep red colour. No recurrence has followed the operation so far.

THE NEWLY-INTRODUCED ROARING OPERATION. AN IMPROVEMENT AND A WARNING.

By F. G. HOBDAY, F.R.C.V.S.,
Kensington, W.

HAVING read in the veterinary periodicals at different times during the past few months several detailed descriptions of the ventricle stripping operations for the relief of roaring in horses, and feeling in some measure personally responsible for one of the errors therein, I should like to make an announcement of an improvement which experience has taught me, and which Dr. Williams has, I believe, now adopted, in the method of incision. It is a well-known fact, both in human and veterinary surgery, that in all operations upon the larynx one of the chief things to avoid is the infliction of the slightest damage to the cartilaginous structures. This is partly on account of the risk of stenosis, and partly from the danger of the formation of granulation tissue as a sequel.

The late Dr. Fleming, in his standard work on the subject of roaring, when describing the operation incision, advises cutting through the crico-thyroid ligament, the cricoid cartilage, and even one, two, or three tracheal rings; and in THE VETERINARY JOURNAL for January of this year, in the preliminary note I published of the operation, I described the division of the thyroid cartilage with a saw, in accordance with the steps Dr. Williams took when he kindly demonstrated to myself and the other English veterinary surgeons who were present at the time.

I now find that it is not at all necessary to cut any cartilage, neither the thyroid nor the cricoid, as the incision which can be made through the crico-thyroid ligament alone gives ample room in any horse for the stripping of the ventricle.

This assertion is based on the experience of more than one hundred separate operations, and cannot be too strongly emphasized, as in itself it does away with any fear of granulatory projections, at all events from this source, and a careful operator has no difficulty in avoiding injury to any of the cartilaginous structures.

SALT FOR STOCK.

A POINT of some importance for keeping stock healthy is the providing of rock salt to cows in the pasture field. In an ordinary cattle ration there is about ¾ oz. of salt, but a milk cow requires a good deal more than that. The milk drains away fully an ounce per day out of system, and unless this is supplied the ash material of their vegetable food does not yield enough. It is most instructive to watch how regularly a cow will come for her "salt lick" once she knows where it is to be found, and at the end of the grazing season there is a very noticeable difference between cows who have had regular access to salt and those who have not. Penkeepers as a rule observe this point, but small owners of stock very seldom think of supplying salt to their animals. The licking of the rock salt induces a flow of saliva, and to give salt in this form is better than giving salt in the food where animals are hand fed.—*The New Zealand Dairyman and Farmers' Union Journal.*

Abstract.

GOVERNMENT CERTIFICATION OF STALLIONS IN VICTORIA, AUSTRALIA.[1]

By S. S. CAMERON, D.V.Sc., M.R.C.V.S.

Chief Veterinary Officer for Victoria.

In 1907, the then Minister of Agriculture (the Hon. Geo. Swinburne, M.L.A.) approved of the establishment of a system of Government control in respect of stallions standing for public service, directed primarily towards insuring the soundness from an hereditary standpoint of all stallions in the State, and also that such stallions should conform to a reasonable standard of excellence as regards breed, type, and conformation. The system has now been carried out through three seasons, and it is proposed to review its operation and administration during that period.

It may be said at once that, in this review of the work of the past three years, it will not be claimed that a definite and measurable improvement has already been attained. It will be some years more before the real benefit of this three years' work will be appreciable. It is true that about one-fourth of the stallions examined have been refused the Government Certificate, but it will not be possible to estimate the improvement that can be effected until power is given by legislative enactment to prevent or limit the use of rejected stallions. What may be claimed, however, is that in the three years examinations have shown:—

(*a*) That unsoundness of an hereditary character exists to a considerable extent in the stallions standing for public service. (The figures in the Table of Totals herein show 15·83 per cent. of rejects for hereditary unsoundness).

(*b*) That there is a considerable proportion of sires at present in use unfit for the purpose by virtue of their mongrel characteristics.

These two features having been demonstrated, there need be no hesitation in affirming the necessity of completing the scheme by legislative enactment.

During the first season (1907) the scheme was on a voluntary basis. It provided for the purely voluntary submission of stallions for examination. The agricultural societies throughout the State were requested by circular to organize parades at local centres at which the veterinary officers of the Department would attend for the examination of horses brought forward by owners. Fifty-six societies in different parts of the State responded to the invitation, and seventy-eight parades and shows were attended by the examining officers. A total of 918 horses were submitted for examination, representing about 50 per cent. of the stallions standing for public service in the State. Of these, 215 (23·42 per cent.) were rejected and 703 certificated. That such a large number of horses should have been volun-

[1] Abstract from Third Annual Report (Season 1909) on the Veterinary Examination of Stallions for the Government Certificate of Soundness and Approval. The full report, with complete list of names of the stallions, district, and other particulars, are to be found in the April number of the *Journal of Agriculture of Victoria.*

tarily submitted in the face of the rejections that were continually being experienced by owners was in a great measure due to the pressure upon stallion owners of horse-breeders. The owners of mares apparently realized that the scheme was for their ultimate benefit; and, very shortly after the outset, the bulk of them apparently decided to patronize certificated stallions only.

In the following table is set out the number of horses examined in 1907, the numbers of each breed, the number and percentage of horses rejected and certificated, and the number of horses affected with the particular unsoundnesses dealt with:—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1907.

	Draughts		Lights		Ponies		Totals	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	403	271	301	246	214	186	918	703
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	132	32·75	55	18·27	28	13·08	215	23·42
Unsoundness								
Sidebones ...	82	20·35	3	·99	—	—	85	9·35
Ringbones ...	9	2·23	4	1·32	2	·93	15	1·63
Spavin (bone)	3	·74	15	4·95	1	·46	19	2·06
Bog spavin and thoroughpin	2	·49	4	1·32	—	—	6	·65
Curb	—	—	6	1·99	6	2·80	12	1·30
Cataract (eye)	—	—	—	—	1	·46	1	·10
Totals unsoundness	96	23·82	32	10·63	10	4·67	138	15·04
Below standard for approval	36	8·93	23	7·64	18	8·41	77	8·38
Grand totals ...	132	32·75	55	18·27	28	13·08	215	23·42

In 1908, certain modifications of the scheme, dictated by experience gained during the first season, were adopted. As stated, the scheme was on a purely voluntary basis in 1907. There was no obligation on the part of an owner to submit his horse, and the regulations did not provide any disability in respect of horses not submitted, nor, indeed, of horses rejected. The possession of the Government Certificate was no protection at shows against competition from uncertificated horses. A number of cases occurred in which a rejected horse was placed first by the judges over certificated animals. To overcome this anomalous state of things, it was made a condition of the Government grant to agricultural societies that a Government Certificate should be held by all stallions three years old or over

competing. The imposition of this condition made the scheme compulsory in respect of all horses it was desired to show, inasmuch as practically the whole of the agricultural societies throughout the State were receiving a Government subsidy. Along with the introduction of the compulsory condition to the extent mentioned, it was provided that any owner who felt aggrieved at the rejection of his horse should be given an opportunity of appealing against the decision of the examining officer. Since the regulations providing for an appeal were adopted 486 horses have been rejected, and in no instance has the opportunity to appeal been taken advantage of.

In 1908, 118 inspection parades were attended by the Departmental officers, at which 995 horses were submitted for examination. Of these, 742 were certificated and 253 (25·41 per cent.) were rejected. The following table sets out detailed particulars as regards the 1908 season:—

ANALYSIS OF DEFECTS OF HORSES REFUSED CERTIFICATES, 1908.

Defects	Draughts		Lights		Ponies		Totals	
	Number Examined.	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
	501	341	295	242	199	159	995	742
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent Rejected
	160	31·92	53	17·96	40	20·10	253	25·41
Unsoundness								
Sidebones ...	99	19·76	1	·33	—	—	100	10·05
Ringbones ...	20	3·99	7	2·37	3	1·50	30	3·01
Spavin (bone)	3	·59	8	2·71	—	—	11	1·10
Bog spavin and thoroughpin	15	2·99	3	1·01	—	—	18	1·80
Curb	—	—	8	2·71	2	1·00	10	1·01
Roarer ...	—	—	2	·67	—	—	2	·20
Totals unsoundness	137	27·33	29	9·83	5	2·50	171	17·17
Below standard for approval	23	4·59	24	8·13	35	17·58	82	8·24
Grand totals ...	160	31·92	53	17·96	40	20·10	253	25·41

Although, strictly speaking, the 1909-10 season has not been altogether completed, the bulk of the work has been got through, and it has been deemed advisable in this report to submit the figures up to December 31, 1909.

The number of horses examined this season totalled 751, of which 528 were certificated and 223 (29·69 per cent.) rejected. The increase

in the percentage of rejections has been due to a somewhat higher standard being adopted as regards breed, type, and conformation. The rejections under this heading account for 14·65 per cent. this year, as against 8·38 per cent. and 8·24 per cent. in 1907 and 1908 respectively.

The following table applies to the season 1909, and gives particulars identical with those furnished in the previous tables as regards the two previous years :—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES, 1909. (UP TO DECEMBER 31, 1909.)

Defects	Draughts		Lights		Ponies		Totals	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
	408	273	191	147	152	108	751	528
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	135	33·08	44	23·04	44	28·94	223	29·69
Unsoundness								
Sidebones ...	84	20·59	—	—	—	—	84	11·18
Ringbones ...	11	2·69	3	1·57	1	·66	15	1·99
Spavin (bone)	1	·24	2	1·04	1	·66	4	·54
Bog spavin and thoroughpin	—	—	1	·52	—	—	1	·13
Curb	—	—	6	3·14	3	1·97	9	1·20
Totals unsoundness	96	23·52	12	6·27	5	3·29	113	15·04
Below standard for approval	39	9·56	32	16·77	39	25·65	110	14·65
Grand totals ...	135	33·08	44	23·04	44	28·94	223	29·69
New Zealand Examinations (certificated but not included in above figures)	32	—	1	—	—	—	33	—

AGGREGATE RESULTS TO DATE—1907-08-09.

Up to December 31, 1909, 2,664 stallions had been examined, 1,973 having been certificated (74.07 per cent.) and 691 rejected (25·93 per cent.). Of these, 442 (15·83 per cent.) were rejected on the ground of hereditary unsoundness, and 269 (10·10 per cent.) were disapproved as being below a reasonable standard for Government certification. As regards unsoundnesses, detailed particulars concerning the grounds for rejection are given in the following table :—

ANALYSIS OF DEFECTS OF STALLIONS REFUSED CERTIFICATES FOR SEASONS 1907, 1908, 1909 (UP TO DECEMBER 31, 1909).

	DRAUGHTS		LIGHTS		PONIES		TOTALS	
	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated	Number Examined	Number Certificated
Defects	1,312	885	787	635	565	453	2,664	1,973
	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected	Number Rejected	Per cent. Rejected
	427	32·54	152	19·31	112	19·82	691	25·93
Unsoundness								
Sidebones ...	265	20·20	4	·51	—	—	269	10·10
Ringbones ...	40	3·05	14	1·77	6	1·06	60	2·24
Spavin (bone)	7	·53	25	3·18	2	·36	34	1·27
Bog spavin and thoroughpin	17	1·29	8	1·02	—	—	25	·94
Curb	—	—	20	2·54	11	1·94	31	1·16
Cataract (eye)	..	—	.	—	1	·18	1	·04
Roarer ...	—	—	2	·25	—	—	2	·08
Totals unsoundness	329	25·07	73	9·27	20	3·54	422	15·83
Below standard for approval	98	7·47	79	10·04	92	16·28	269	10·10
Grand totals . .	427	32·54	152	19·31	112	19·82	691	25·93

REJECTIONS FOR UNSOUNDNESS.

Of all horses examined, 15·83 have been refused certificates on the ground of hereditary unsoundness solely. This percentage is comparatively small when compared with the results that have been published as regards hereditary unsoundness in some other countries. But any ground for congratulation in this respect is removed when it is realized that in respect of draught horses no less than 25·07 per cent., or practically one-fourth of all horses submitted, have been rejected as being affected with one or other of the hereditary unsoundnesses. The position as regards draught horses cannot thus be considered as other than serious; but hope, as regards a quick improvement from the continuance of the present system of examination, may be gathered from the results that have followed on the similar action which was taken twenty-five years ago by the Royal Shire Horse Society of Great Britain as regards unsoundness. At that time about 30 per cent. of the horses shown had to be rejected for unsoundness. The weeding out process has been going on ever since, with the result that certain families which were then predominant have been practically obliterated, and the families now responsible for the show stock of horses do not contain more than 5 per cent. of horses still carrying the taint of hereditary unsoundness.

Complete records have been kept of the unsoundnesses for which individual horses were rejected, and of the family pedigrees and histories of such horses. It was realized shortly after the commencement of the scheme that the collection of such information would prove extremely interesting as time went on, as tending to prove or disprove, as the case may be, the hereditary character of the unsoundnesses in respect of which rejections have been made. In point of fact, a study of these records has proved of greater interest and more importance than was at first anticipated. By them I have been able to set forth information of a character such as has not been published in detail before. In a contribution to a thesis which I presented to the Melbourne University I was able to furnish particulars of a most interesting character concerning the incidence of unsoundnesses as regards breed and the age period of development of the various hereditary unsoundnesses, as also tables and family histories showing completed evidence of the hereditary character of sidebone, ringbone, curb, and bog spavin. As this University paper will be published as an addendum to this report, there is no necessity to here repeat the details and conclusions set forth in it.

As compared with the draught horses, it is satisfactory to find that only 9 per cent. of light horses have been rejected, and in the case of ponies the rejections for unsoundness have been particularly low —namely, 3·5 per cent.

Rejections as regards Standard.

On the other hand, more ponies (16·28 per cent.) and light horses (10 per cent.) have been rejected as being below a reasonable standard for Government approval than in the case of draught horses, of which only 7·4 per cent. have been rejected for this season.

On this aspect of the working of the scheme, it is opportune to again draw attention to the necessity (which, in my opinion, is urgent if the quality of the horse stock of the State is to be improved) of strengthening this side of the scheme. I have previously pointed out that the veterinary officers engaged in the work of examination have had no desire to undertake the function of judging as regards breed, type, and conformation, and it may be said that they have only exercised this function in respect of stallions presented to them, which it would have been for them a matter of shame to have signed a certificate in favour of. With a staff of competent judges to deal with this aspect of the matter as firmly as the veterinary officers have dealt with the unsoundness aspect, much-needed weeding out of inferior sires would be brought about in the course of two or three years. It is idle to say that in respect of type, breed, and conformation, matters should be left in the hands of breeders themselves to determine. It is to such a drifting policy that, in a large measure, may be attributed the deterioration as regards quality that is being complained of on all hands. If quality of progeny is to be maintained, the standard of sires must be kept up. Even with the use of the best sires, there is always a sufficiency, if not a redundancy of misfits. Mediocre horses, as regards quality, type, and power may be, and are, bred in sufficiently large numbers, even when the best sires are used on mediocre mares; and to add to the trouble by using also a mediocre sire will inevitably result in a still further

deterioration. The present position of affairs indicates plainly that the matter cannot be safely left in the hands of breeders. It is too true that many breeders are too prone to patronize inferior stallions, because of their cheapness; and to save them from themselves, it has become necessary that an efficient method of Government control should be fearlessly carried out.

Extension of the Scheme to other States.

The system adopted three years ago in Victoria has been put into force in the three neighbouring States of New South Wales, Queensland, and South Australia. Each of these States commenced to carry out examinations under regulations practically identical with those which have been operative in Victoria. So far, however, the system in the sister States has been confined to examination of stallions at shows. Consequently, the numbers that have been examined in the States named have been comparatively small. Figures are not to hand from South Australia, but tables of results have been published as regards examinations made to date in Queensland and New South Wales. For purposes of comparison, I append a table setting out the numbers of stallions examined and rejected in Victoria, Queensland, and New South Wales respectively during the season 1909. They are as follows:—

Class	Number Examined			Number Rejected			Percentage Rejected		
	Victoria	Q'land	N.S.W.	Victoria	Q'land	N.S.W.	Victoria	Q'land	N.S.W.
Draughts..	408	55	13	135	27	7	33·08	49·09	53·84
Lights ...	191	78	14	44	13	2	23·04	16·64	14·28
Ponies ...	152	32	9	44	3	1	28·94	9·37	11·11
Totals ..	751	165	36	223	43	10	29·69	26·06	27·77

Reciprocal Arrangements with other Countries.

Prior to the commencement of the 1909 season, it was arranged, in order to meet the convenience of importers of horses from New Zealand, that the Victorian Government would issue the Government Certificate of Soundness without examination in respect of horses imported from New Zealand which had been there examined by a Government veterinary officer and certified under the conditions laid down in the Victorian Regulations. Altogether, under this departure, thirty-three New Zealand certificates were accepted and exchanged for the Victorian Government Certificate. Doubtless, prior to the commencement of the forthcoming season, similar arrangements will be entered into with the Governments of New South Wales, Queensland, and South Australia, whereby a horse certificated in one State will be accepted by the Government of every other State as qualified for certification in such State. Before this can be arranged, however, it will be necessary that the States concerned shall be satisfied as to the uniformity of standard of examination and as regards the unsoundnesses constituting a bar.

ENGLISH EXAMINATIONS.

In order to insure that only sound horses are imported from Great Britain in the future, and to avoid disappointment and loss on the part of importers, it was decided before the commencement of last season that certificates issued by certain societies in England, Scotland, and Ireland would be accepted here as a basis for the issue of the Victorian Government Certificate of Soundness, without further examination at this end. The societies asked to co-operate in this matter were the Royal Shire Horse Society (England), Royal Agricultural Society (England), Royal Dublin Society's Horse Show (Ireland), Highland and Agricultural Society (Scotland), and the Glasgow and West of Scotland Agricultural Society. To this end the societies named were written to some time ago and asked to authorize and undertake the duty. So far, replies have been received from the Royal Dublin Society, the Highland and Agricultural Society, and the Shire Horse Society. The two former letters intimate that those societies are to take the matter into consideration shortly, and the Shire Horse Society, in its letter, states that its Council has decided to accede to the request of this Government, and has authorized for the purpose examination by their Senior Veterinary Inspector (Professor Penberthy). Certificates will be accepted from Professor Penberthy, not only in respect of shire horses, but in respect of horses of any breed, as also certificates from the veterinary inspectors of the other societies named, provided such certificates are issued officially on behalf of the societies.

REGULATIONS AND LIST.

Regulations governing the examination of stallions, together with list of certificated stallions, have been published each year at the close of the season, and may be had on application to the Secretary.

During the season 1907, fifty-six parades and shows were attended; during 1908, the examinations were conducted almost wholly at parades, of which 118 were arranged for and attended. During the last season (1909), 124 parades have been carried out.

EXAMINING OFFICERS.

So far as possible, the desire has been in this State to make the examinations uniform. To that end, not more than four officers have been engaged each season on examinations. After the first year, however, Mr. Norman McDonald, G.M.V.C., retired from the service of the Department to visit England. During the second season I ceased conducting examinations personally, in order that my position on the Court of Appeal might not be prejudiced. Messrs. W. J. Colebatch, M.R.C.V.S., and W. A. N. Robertson, G.M.V.C., have been examining officers throughout, and for the past two seasons Mr. J. Lyons, M.R.C.V.S., and Mr. E. A. Kendall, G.M.V.C., completed the staff. It is to be regretted that, in future, the scheme will not have the valued assistance of Mr. W. J. Colebatch or Mr. J. Lyons, both of whom have retired from the Government service in this State to undertake more lucrative positions in South Australia and New Zealand respectively. The examining staff has, however, been increased by the addition of Mr. R. Griffin, M.R.C.V.S., and Mr. W. J. Cother, G.M.V.C. It is not too much to say that the success that has attended

the carrying out of the scheme so far has been in a great measure due to the high qualifications possessed for this class of work by the officers concerned, whereby the fullest confidence of both the Government and the horse-breeding public has been established.

Review.

A Handbook of Practical Parasitology. By Dr. Max Braun and Dr. M. Lühe, Königsberg. Translated by L. Forster. Pages 208 + viii., and 100 illustrations. Published by Messrs. Bale, Sons, and Danielsson, Limited, London. Price 10s. 6d. net.

This excellent little book is one that should be in the hands of all students of parasitology. It deals solely with animal parasites, and is written in three parts, dealing respectively with parasitic Protozoa, Helminths, and Arthropoda. In each section the authors give the most useful information as to the technique for obtaining and examining material. It is obvious that proper methods are essential to reliable examinations, and we confidently assert that no student of parasitology can fail to make excellent preparations for examination, &c., if he follows the lines laid down by the authors. We confidently recommend this book—which is excellently produced—to all workers in parasitology.

Personal.

Mr. G. L. Y. Ingram, M.R.C.V.S., has been appointed Veterinary Assistant at the Brown Institution.

Mr. T. W. W. Wright, M.R.C.V.S., has been appointed Tutor, and Mr. D. A. E. Cabot, M.R.C.V.S., Assistant Hospital Surgeon, in the Royal Veterinary College, London.

Mr. Percy Simpson, F.R.C.V.S., of Maidenhead, the popular President of the Royal Counties Veterinary Medical Association, has been appointed Veterinary Referee at the forthcoming Dublin Horse Show.

ROYAL COLLEGE OF VETERINARY SURGEONS.

Examinations in London.

At a meeting of the Board of Examiners held in London on July 8 for the written, and on and between July 12 and 15 inclusive for the oral and practical examinations, the following gentlemen passed their final examination:—

Mr. D. A. E. Cabot	Mr. B. A. Myhill
,, D. H. Dimes	,, D. Meadows *
,, G. Fox.	,, A. H. McDougall
,, H. C. D. Golledge	,, C. J. S. Macara-Finnie
,, B. Gorton	,, G. T. S. Mower
,, W. D. Jordan	,, G. V. Slinn
,, E. C. Lloyd	,, O. Stinson
,, R. E. Lloyd	,, A. B. Fewings
,, L. H. Leach	,, R. C. G. Thwaytes
,, S. Little	,, T. W. W. Wright

The following passed their third examination:—

Mr. R. B. Cockburn	Mr. F. F. Horton
,, O. Dixon	,, C. Holland *
,, T. J. Davis	,, F. C. Minett *
,, J. T. Edwards †	,, W. A. Pool *
,, G. V. Golding	,, G. F. Steevenson †
,, H. E. Hornby *	,, H. Stephenson

The following passed their second examination:—

Mr. V. Boyle *	Mr. P. Howard
,, O. S. Broadhurst	,, S. W. Marriott
,, K. J. S. Dowland	,, W. F. Morton *
,, J. Facer	,, K. H. Soutar
,, E. S. Farbrother	,, J. M. Smith
,, J. Going	,, G. M. Vincent
,, S. J. Gilbert *	,, P. R. Viljoen †
,, W. P. Hamlyn	,, U. W. F. Walker
,, A. C. Holl *	,, E. J. B. Sewell

The following passed their first examination:—

Mr. W. A. Austin*	Mr. H Hicks*
,, D. Blyth	,, H. A. King
,, C. Davenport*	,, R. H. C. Lucas
,, H. W. Dawes†	,, G. F. Marais *
,, G. van de W. De Kock	,, W. H. Priston
,, W. P. S. Edwards	,, J. M. L. Penhale *
,, G. R. Grey *	,, W. B. Pershouse
,, A. Hoskin *	,, R. H. Stalker
,, R. C. G. Hancock	,, J. Southall
,, W. B. Howe *	,, W. L. Sheffield*
,, V. J. Hare	,, A. R. Smythe *
,, G. C. Harding	,, H. S. Wright

Marked thus † passed with First Class Honours.
Marked thus * passed with Second Class Honours.

Examinations in Liverpool.

At a meeting of the Board of Examiners held in Liverpool on July 8, for the written, and on and between July 14 and 16 inclusive for the oral and practical examinations, the following gentlemen passed their final examination:—

Mr. J. R. Barker	Mr. C. W. Makinson
,, W. A. Dykins	,, H. Quiggin
,, R. Hopps	,, W. R. O. Williams

The following passed their third examination :—

Mr. A. W. Allen	Mr. K. S. Jones
,, T. Craig	,, W. P. Stokes *
,, G. G. Howard	

The following passed their second examination :—

Mr. V. A. Bartrum	Mr. C. W. Loy
,, R. Isherwood	,, J. W. Proctor
,, R. H. Knowles *	,, H. Sumner

The following passed their first examination :—

Mr. J. Blackburn *	Mr. J. A. Ward †
,, C. W. Elam †	

Marked thus † passed with First Class Honours.

Marked thus * passed with Second Class Honours.

Examinations in Dublin.

At a meeting of the Board of Examiners held in Liverpool on July 8 for the written, and on and between July 14 and 19 inclusive for the oral and practical examinations, the following gentlemen passed their final examination :—

Mr. F. B. Hayes	Mr. R. O'Donnell
,, R. H. C. Higgins	,, J. F. O'Grady
,, T. R. Hunt	,, E. L. Porter
,, A. C. Kirkpatrick	,, F. J. Sheedy
,, P. McDonnell	,, F. T. Smyth
,, Wm. Nyhan	

The following passed their third examination :—

Mr. H. W. Carbury	Mr. A. S. Mathias
,, Peter Francis Dolan	,, T. F. O'Brien *
,, Desmond English *	,, Cecil Roche
,, Thos. Gordon	,, Thos. L. Shea
,, Esmond W. Little	,, Nasli Dinshaw Vakel

The following passed their second examination :—

Mr. John Jos. Cosgrove	Mr. Thomas O'Leary
,, H. E. A. L. Irwin	,, Jerome J. O'Neill
,, Thos. McD. Kelly *	,, John Quinlan †
,, Michael McClancy	,, Fredk. B. Sneyd
,, Daniel J. O'Byrne	

The following passed their first examination :—

Mr. Thomas G. Browne	Mr. Jos. Jas. Mills
,, T. D. Condell	,, John P. McNally *
,, J. R. Ellison	,, John Jerome Pomeroy
,, David E. Greene *	,, A. P. Preston
,, Mark P. Hatch	,, Thomas Reddin
,, J. J. Hegarty	,, C. M. Stewart *
,, St. J. C. P. McFarlan	,, Michael Toomey

Marked thus † passed with First Class Honours.

Marked thus * passed with Second Class Honours.

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Bulletin of the Bureau of Sleeping Sickness; Annual Report of the Proceedings under the Diseases of Animals Acts, for 1909; Journal of the Quekett Microscopical Society; Journal of the Royal Army Medical Corps.

Letters and Communications, &c.

Mr. Lewis; Mr. A. N. Pillers; Mr. C. H. Huish; Mr. F. Bullock; Mr. A. Wilson; Mr. Burton Rogers; Board of Agriculture and Fisheries; Department of Agriculture and Technical Education for Ireland, &c.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

Manuscript—preferably type-written—should be on one side only of paper, marked with full name of author.

Illustrations for reproduction should be in good black or dark brown on white paper or card.

Advertisements and all business matters relating to the JOURNAL should be addressed to the publishers, Messrs. Baillière, Tindall and Cox.

THE

VETERINARY JOURNAL

SEPTEMBER, 1910.

Editorials.

CONTAGIOUS GRANULAR VAGINITIS IN CATTLE.

DURING the present year we have reproduced several very instructive papers in the VETERINARY JOURNAL on the above subject from the pens of such well-known Continental observers as Professor Hess and Mr. Albrechtsen, and Mr. Ainsworth Wilson in this country; and as the matter is of such vital importance to agriculturists we make no apology for again referring to it. In an editiorial note in our March issue, before Mr. Wilson's paper appeared, we referred to the fact that the diseasc was undoubtedly preseut in Britain, although it had largely escaped observation, probably owing to its running a somewhat benign course, and not giving rise to acute or distressing symptoms. The disease is undoubtedly responsiblein Europe and America for a considerable amount of sterility, and although the form prevailing here would appear to be much less virulent, it would be unwise to close one's eyes to the probability of its being also closely associated with sterility in this country, With this in mind, we wrote in March last: "The subject of sterility is very intimately associated with abortion, and it would confer a great boon upon the agricultural community if the commission now investigating abortion were to be instructed to extend their researches fo include sterility in cattle." Hence it is particularly gratifying to us to see in the report of the Chief Veterinary Officer of the Board of Agriculture a portion of which we reproduce on pp. 523-6 that the affection has not in the least been

overlooked. In fact, Mr. Stockman calls attention to it "on account of its very contagious nature and the possible importance of its results." We do not believe, however, that contagious vaginitis in this country is generally regarded as a cause of abortion, but that it is frequently a cause of sterility by interfering in some manner with conception.

Undoubtedly our knowledge of these contagious diseases of the genital organs is very meagre; there is much confusion. In his paper Mr. Ainsworth Wilson attempted to differentiate between several of them, but apparently Mr. Stockman is of opinion that what the former regarded as two diseases is only one disease. In describing an acute form of "Contagious Granular Vaginitis" Mr. Stockman says: "This form is probably what has for many years been known to farmers as "bull burn." Mr. Wilson regards the latter affection as an entirely different disease—viz., vesicular vaginitis. Judging from his report and from his statements when opening the discussion on the subject at the meeting of the National Veterinary Association, we gather that Mr. Stockman doubts the existence of two forms of contagious vaginitis in cattle, one granular and one vesicular, while Mr. Wilson affirms their dual existence.

It would not be so very difficult to follow if the differences of opinion ended there, but worse is to follow. During the discussion at the National, Sir John M'Fadyean stated in no unmeasured terms that he emphatically disagreed with Mr. Wilson's statements as to the existence of contagious granular vaginitis over any widespread area in this country, a view which is obviously also in disagreement with the statement of the Chief Veterinary Officer of the Board of Agriculture. He did not, however, throw any light on the nature of the contagious disease of the external genitals of cows and bulls which undoubtedly does exist in the British Isles, and which is commonly known as "bull burn."

Amongst these variations of opinion what is one to believe? Our view is that there are two contagious forms of vaginitis. We have frequently met in various parts of the country with a contagious vesicular vaginitis easily and readily transmissible from cows to bulls and *vice versa*. The symptoms are quite distinct from those of contagious granular vaginitis described by

Mr. Wilson, and by Mr. Stockman as a chronic form, and by the various Continental authorities.

We sincerely endorse Mr. Stockman's hope that it will be possible to conduct further inquiry into this disease, and suggest that the most desirable procedure would be to extend the scope of inquiry of the Committee on Epizootic Abortion. That committee must have obtained an enormous amount of information and material such as would be of the greatest possible assistance in an investigation into other contagious affections of the generative organs of cattle. It would be a pity, if not a disaster, to lose the opportunity, and we trust the Board of Agriculture will again rise to the occasion.

MONTHLY MAGAZINES AND THE POST OFFICE.

THE Editor of the *Agricultural Economist and Horticultural Review* is to be congratulated on the effort he is making to induce the Postal authorities in this country to modify the harassing and archaic regulations which hamper the development of the periodical press other than weeklies and dailies. It is obviously absurd that a certain number of weeklies, in many instances weighing several pounds, can be conveyed by post for a ½d., whilst scientific magazines like ours one quarter of the weight have to pay 1½d., per issue. In no respect are we further behind the United States in commercial and agricultural enterprise than here. Our contemporary points out, for instance, that five copies of that journal, if published in the United States of America, could be sent through the post to any village or hamlet in that vast territory for 1d.; while in Great Britain every single copy posted costs 2d. The Post Office here absorbs nearly 40 per cent. of the subscription revenue of the paper; in the United States it would only claim a moderate 5 per cent., or less. This tax cripples the development of the scientific and lay press in this country. We cordially support the effort now being made to convince the Post Office authorities that the time has now come to make a drastic modification of the out-of-date hindrances to the development of magazine literature.

General Articles.

SOME INJURIES TO THE FLEXOR TENDONS AND SUSPENSORY LIGAMENT.[1]

By J. MACQUEEN, F.R.C.V.S.

Professor of Surgery in the Royal Veterinary College, London.

In discussing this subject it is desirable briefly to recall the arrangement and relations of the structures exposed to injury.

Fore-limb.—The flexor perforans muscle, three times larger than the perforatus, arises from the humerus, radius, and ulna, and extends to near the knee where its tendon begins. The tendon passes through the carpal arch to the middle of the canon, where it is joined by the sub-carpal ligament, then downwards to the fetlock, where it passes through the perforatus ring and over the sesamoid pulley. Descending behind the pastern, under the bifid insertion of the perforatus and over the glenoid prominence and navicular bone, it is inserted on the semi-lunar crest of the os pedis. Slightly compressed at the knee, it is rounder at the canon, considerably expanded and flattened at the fetlock, narrowed though still flat behind the suffraginis, at the os coronæ, to which it is loosely attached, it again expands and rapidly attains its greatest breadth at its insertion. In volume it varies little from its origin to the point of junction with the subcarpal ligament, and below this the increase is hardly noticeable owing to the gradual attenuation of the reinforcing band. At the fetlock the tendon is thicker, and its anterior surface, moulded on the sesamoid pulley, shows some of the characters of fibro-cartilage. Another increase in thickness and firmness occurs at the os coronæ. It appears to be weakest at its terminal expansion which, however, is well supported by the posterior digital ligament.

The sub-carpal or "check" ligament, a direct continuation of the posterior common ligament of the knee, is united at its origin to the anterior fibrous wall of the carpal arch and the suspensory ligament. Descending, it closely embraces the anterior surface of the perforans, which it appears to join at the middle of the canon. In many instances their fushion is very gradually effected, as some indication of the parts of tendon and ligament can be traced to near the fetlock. The sub-carpal ligament is the strongest portion of the suspensory apparatus of the fetlock.

The perforatus or superficial flexor muscle, arising with a portion

[1] Portion of paper read at the National Veterinary Association Meeting at Harrogate.

of the perforans from the humerus, extends to near the knee where it is succeeded by tendon. In close contact throughout with the perforans, the tendo-perforatus passes through the carpal arch to near the fetlock, where it forms a sheathlike ring for the perforans, then descending and becoming somewhat broader it terminates by a bifid insertion on the os coronæ. Before entering the carpal arch the perforatus is joined by the radial ligament, which hitherto has attracted little attention outside the dissecting room.

The radial ligament arises from the inner border of the posterior surface of the lower extremity of the radius and extends obliquely downward and outward to join the perforatus tendon. It is a short, rather lax fibrous band, between 2 and 3 in. long, about an inch broad, and less than ½-in. thick. Recently in Germany and France, cases of lameness have been attributed to strain of this ligament.

The suspensory ligament, arising from the lower row of carpal bones and the head of the canon, descends between the sub-carpal ligament and metacarpus to near the "buttons" where it bifurcates. Each branch is implanted on the excentric surface of the corresponding sesamoid, and a portion of each band is continued downward and forward to join the extensor pedis tendon. From its origin to the point of bifurcation the suspensory is flattened and closely applied to the canon, its branches to the sesamoids are rounded, and the extensor bands are flat. It has a covering of connective tissue which attaches it to the canon and flexor aponeurosis. In structure it differs from the tendons by containing fasciculi of striped muscle and some fat.

Hind-limb.—Apart from their points of origin and a few other differences, the more important features are: The perforans in the tarsal arch is not accompanied by the perforatus; at the upper metatarsal region it is joined by the tendon of the accessory flexor muscle, and near the middle of the shank by the sub-tarsal ligament, which though longer is less thick or strong than the sub-carpal ligament. The perforatus has a very short muscular portion, and its tendon, beginning just below the upper third of the tibia, after a winding course, reaches the point of the hock, where it forms a cap for the summit of the os calcis. Below the hock the perforatus descends the shank, as in the fore limb, to the os coronæ.

Tendon is made up of groups of parallel white fibrils, interspersed with flattened nucleated connective tissue cells, arranged in rows running in the direction of the tendon fibres. Between the bundles are inter-fascicular spaces, and primary and secondary connective tissue septa, continuous with the peritendinous covering. The nerves

(few and non-medullated), blood-vessels, and lymphatics ramify in the septa. The sub-carpal and sub-tarsal ligaments have thicker interfascicular septa and are more vascular than the tendons.

Peritendineum.—Each tendon has its own covering of connective tissue. This is composed of several laminæ, more or less united, closely investing the tendon, continuous inwardly with the interfascicular septa, and connected outwardly, according to the part examined, with the visceral layer of the flexor synovial sheath, the common aponeurosis, or the adjoining tendon or ligament. Between its laminæ the vessels and nerves break up to penetrate the interfascicular septa of the tendon.

Aponeurosis.—The metacarpo-phalangean or common aponeurosis furnishes a subcutaneous covering to the flexor tendons and sub-carpal ligament and separates these from the suspensory. It consists of two principal layers of fibrous tissue, united to each other and to the tendons or parietal synovial sheath by areolar tissue and continuous with the posterior wall of the carpal arch and fascia of the forearm. It forms a strong fibrous brace for the flexor tendons at the sesamoids and pastern, and supports and protects the vessels and nerves. In the hind limb the metatarso-phalangean aponeurosis is similarly arranged.

Synovial sheaths facilitate movement of the tendons, consisting of two parts continuous with each other; a parietal, lining the aponeurosis or other supporting tissue, and a visceral, investing the proper covering of the tendon. The opposed surfaces are lined with endothelium.

The carpo-metacarpal sheath, extending from about 2 inches above carpus to near the middle of the canon, lines the carpal arch and part of the metacarpal aponeurosis; reflected on both tendons in the carpal arch and below on the perforans, posterior surface of the sub-carpal ligament and anterior surface of the perforatus tendon. From an inch or two below the carpal arch to the upper margin of the sesamoid sheath the perforatus has no synovial membrane on its posterior surface, and the anterior surface of this portion of the tendon is separated by loose connective tissue from parietal synovial membrane of the perforans.

The great sesamoid sheath extends from the level of the "buttons" to the middle of the os coronæ, where it is separated from the navicular bursa by an attachment of the perforans, lining the aponeurosis and sesamoid pulley and reflected on flexor tendons, being modified at the sesamoids by the absence of endothelium on the anterior surface

of the perforans. There is no synovial covering on a portion of the posterior surface of the perforatus, which is united to the aponeurosis of the fetlock.

The navicular bursa or sheath extends from the middle of the os coronæ to below the navicular bone, and forms a short synovial sac between the perforans and the navicular bone and its interosseous ligament.

Strain.

Strain, partial rupture of tendon or tendinitis, varies in gravity with the degree of injury, the position of the strain, and the cord affected. Strain may be slight and limited to a few axial or peripheral fibres (tendinitis), or severe, and involve a considerable portion of the thickness of the tendon, including its connective tissue covering (paratendinitis). In strain affecting few or many fibres the ruptures may occur at one level (short strain), or owing to subsequent tearing or secondary ruptures at different levels, the laceration may represent a sloping breach of the tendon (long strain). In most cases there is a centre of limited rupture, but owing to consecutive inflammatory changes the distension extends above and below the seat of injury. In this way, amongst others, the diffused thickening of the sub-carpal ligament and the elongation of the primary distension of "bowed" perforatus are produced.

Position of Strain.—The perforans, though far less frequently affected than is generally supposed, may be strained just under the knee, at its junction with the sub-carpal ligament, at the sesamoids, behind the pastern or in the "heel pan," where it is very difficult to distinguish distension of this tendon from rupture of the digital aponeurosis or bursitis of the synovial sheath. The sub-carpal ligament may be strained close to its fusion with the perforans, near its origin below the knee, or towards the fetlock at its real termination. The strain may be short or limited to an inch or two of the ligament, but as there is a constant tendency to extension of the inflammation, most often the distension is diffused.

The perforatus may be strained at the knee, at the middle of the canon, or at the fetlock. Occasionally strain occurs at other points, as within the carpal arch and at the bifurcation of the tendon behind the pastern. Strain of the radial ligament as a primary injury must be very rare, though acute bursitis of the carpal sheath, caused by bruising, sometimes extends to this ligament.

Strain of the suspensory usually occurs immediately above its

bifurcation or affects the inner branch. In dilaceration or upward splitting of the suspensory the apparent strain may extend to the upper third of the ligament.

The relative frequency of strain at these sites cannot be possibly stated, because cases are seldom seen early enough to permit of accurate diagnosis. But perhaps the commonest strain of the perforatus is represented by "bowed tendon" at the middle of the canon, that of the perforans at the fetlock, and that of the subcarpal ligament near its junction with the perforans.

Regarding the comparative frequency of perforans, perforatus, sub-carpal, and suspensory strain there is hardly more justification for confident assertion. However, one may say that in cart horses the sub-carpal ligament is more often strained than the perforans, that by extension of inflammation the perforatus is often implicated, and that strain of the suspensory is very seldom seen. In saddle horses, racehorses, chasers, hunters, and polo ponies strain of the perforatus or of the suspensory is more common than strain of the perforans. Anterior strains are much more frequent than posterior strains.

Statistics and published cases of flexor strain should not be accepted without caution. Repeated examination of the leg is required to distinguish the tendon strained, and in many cases some doubt remains. Poy, analysing 230 cases of anterior strain in horses engaged at fast work, gives 116 suspensory alone, 17 suspensory and one tendon, 34 perforatus, 30 both flexors, 16 sub-carpal ligament, 10 sub-carpal and one tendon, and 7 perforans. Barrier found the suspensory affected five times in eleven cases, and Jacoulet thirteen times in eighteen cases of strain in saddle horses; and in six months at Saumur, Joly had 75 cases in horses particularly exposed to strain by attenuation of shock: 25 perforatus, 17 suspensory, 17 affecting the tissues connecting the perforatus and sub-carpal, 1 perforans, and 8 affecting the tendons without possible distinction. Lesbre, from observations made in the dissecting-room, considers that the sub-carpal ligament and perforans are more frequently strained than the suspensory. Other observers have found the suspensory affected 24, 50, and 54 times in 100 cases of strain, and Pader states that probably many cases of apparent distension of the suspensory may be due to *Filaria reticulata*, as in 37 cases of parasitic invasion of this ligament, 13 presented enlargements identical with the lesions of chronic strain. In nine years, according to Fröhner, 36,230 horses of the Prussian Army were treated for inflammation of the flexors and tendon sheaths, and of this number 70 per cent. were affected in both

flexors of one limb, and 20 per cent. in the suspensory. The right fore leg was affected in 43 per cent., and the left in 36 per cent. of the cases. Later German statistics give, for one year, 2,695 cases: 1,090 both flexors, 495 suspensory alone, 401 perforans alone, 286 perforatus alone, 120 both flexors and suspensory, 49 sub-carpal ligament, 1 radial ligament, and 45 synovitis or rheumatic tendinitis. In the French army the admissions for strained tendons and fetlocks were 1,080 in 1891, and 3,923 in 1897. In the British Army, with an effective home strength of 21,000 horses in 1907, the admissions for strained tendons were 634, and for strained ligaments 834. Unfortunately the distribution of these strains is not given in the report from which these figures were obtained, but the small number of cases is both remarkable and gratifying.

Causes.—Predisposing, or contributing and exciting causes, are recognised, but as many of these appear to be interdependent they will be placed together. Defective conformation is represented by long, upright, or too oblique pasterns, buck knees, crooked legs, and tied-in tendons. Bent knees, especially when congenital, should be excepted, as they appear to save the tendons, and in this belief some owners and trainers prefer horses that lean a little at the knees. Tendons, though thick and apparently strong, may be weak, defective in quality, of unequal density, less resistant, and more liable to strain; these defects being due to heredity, breeding, rearing, or dieting. Other causes are premature work or training before complete growth or consolidation of the tendons and ligaments; forced training or pushing the preparation of the young horse; nervous excitability in thoroughbred and some other horses, by inducing more energetic efforts; fast work, especially racing, chasing, hunting, and trotting (perforatus and suspensory strains); muscular fatigue towards the finish of a fast run race or in galloping too far, and weak flabby muscles, by relaxing the flexors and too suddenly throwing the support of the fetlock on the tendons; heavy draught work, starting or backing a load, holding back going down hill, and shunting (sub-carpal or perforans strain); antecedent disease, adhesions, with or without shortening, worn tendons, chronic disease of tendon, aponeurosis, or synovial sheath: hard ground, by increasing the flexion of the pastern and the tension of suspensory and perforatus; heavy holding ground by detaining the foot, impeding movement and increasing effort, ground with a soft or movable surface-layer as grass after rain, and wood or asphalt when wet or greasy, by causing slipping; ringbone and enlargements of the pastern by hindering or preventing

movement of the joints and consequent relaxation of the tendons (perforans strain); long toes and low heels and shoeing with tips predispose to strain of perforans and perforatus. Slipping in the stable or on the road, a false step, and in a tired horse a sudden acceleration of speed may cause strain.

In forming an estimate of the merits of these causes attention should be given to the action of the fetlock and pastern. The fetlock, with its angle open in front to about 150°, is sustained by the suspensory and supported by the flexor tendons. The suspensory yields a little when the fetlock sinks and regains its former length when the fetlock rises. In movement, the tension of the suspensory is in proportion to the degree of dorsal flexion of the fetlock, and if it is elastic the property of stretching is due to the muscular fasciculi incorporated with its fibrous tissue. Immediate *post-mortem* examination of the suspensory reveals no sign of special elasticity, and in the thoroughbred during movement it appears to be rather thicker when relaxed. Pader holds that the suspensory is not more elastic than the tendons, and Lesbre suggests that the lengthening or yielding of this ligament is more apparent than real because of its bifurcation and the position of its attachments to the pastern. Implanted on the free or outer side of the sesamoids, it acts like a cord suspending the pulley by its axis, and when the fetlock descends the sesamoid mass passes between the branches of the ligament. However this may be, the suspensory acts by a direct pull on the sesamoids, while the flexor tendons furnish a movable support to the fetlock, and together tendons and suspensory may be regarded as a single power acting at the sesamoids on the lever of the pastern to oppose the descent of the fetlock and closure of its angle in front. In the standing position the weight transmitted through the canon falls on the fetlock where it meets the inclined articular surface of the pastern and is resolved into two parts—one perpendicular to the inclined surface, the other parallel to it. The perpendicular weight exerts its pressure on the pastern bones which neutralize it by their resistance, while the other part, which abuts behind on the sesamoids, tends to force the fetlock downwards by inducing oscillation of the pastern lever with consecutive closing of the metacarpo-phalangean angle. This tendency is overcome by the tension of the suspensory apparatus, which keeps the fetlock in position and preserves its normal angle. In locomotion, when the foot comes to the ground, the pressure supported by the fetlock is represented by the weight of the body plus the force of inertia resulting from the acquired speed. The more rapid the pace the greater

the pressure; and while the foot is in contact with the ground the fetlock, at first, is a centre of attenuation of shock and afterwards a centre of impulsion. Its mechanism was investigated in 1891 by by Barrier and Siedamgrotzky. Working independently, with the assistance of instantaneous photography, they arrived at very similar conclusions, which as regards the causation of strain may be shortly stated: When the foot is coming to the ground the oblique canon forms with the pastern a straight line (fig. *a*, 2). When the foot is in support the canon becomes vertical, while the pastern approaches more or less the horizontal. In virtue of the marked dorsal flexion of the fetlock, the pastern or phalangean lever oscillates in two different directions; forwards and upwards on the canon and downwards on the os pedis and navicular. These two movements of oscillation are absolutely simultaneous, and they produce at once closing of the angle of the fetlock and flexion of the coffin joint (fig. *a*, 3). But the effect of this closing of angles is different on each flexor tendon. The perforans representing a cord extending from the head of the canon (origin of sub-carpal ligament) to the os pedis is relaxed, the inflexion of the pastern having shortened the distance from its two points of insertion. The perforatus, extending ftom the radial ligament to the base of the pastern is made tense, in consequence of the separation of its points of attachment, and for the same reason it more closely braces the fetlock. Towards the middle of this stage the suspensory reaches its maximum of tension and is most exposed to rupture.

From this moment of the support the angle of the fetlock effects a sort of forward oscillation, the pastern straightens, and the flexion of the coffin joint progressively diminishes, whilst the canon is inclined forwards (fig. *a*, 4). This oscillation of the fetlock and the simultaneous straightening of the pastern have the effect in a fast pace—as a striding gallop—of effacing the angle which was formed at the hoof, and of producing a little greater closing of the metacarpo-phalangean angle. Under the influence of these two causes the tendons are immediately stretched and quickly reach the limit of their extension. The more extensive the oscillation of the angle of the fetlock on the articulation of the foot the greater the tension of the sub-carpal ligament, so that at this instant the least supplementary effort may cause a rupture.

Inferentially these observations may be summarized: (*a*) strain of the suspensory is produced by excessive tension (paratonia) of the ligament at the moment of greatest dorsal flexion of the fetlock, when

by inflexion of the coffin joint the semi-lunar crest is brought nearer the sesamoid pulley and the perforans is relaxed (fig. *a*, 3); (*b*) the perforatus may be strained in the same way as the suspensory, with which it shares the charge of supporting the fetlock when the foot comes to the ground; (*c*) strain of the sub-carpal ligament or perforans is produced by excessive tension (paratonia) of the tendon at the moment

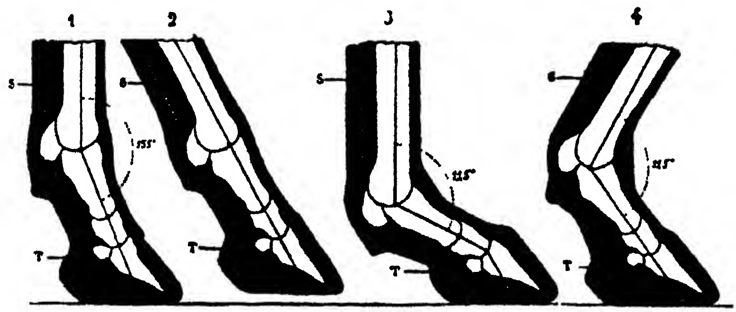


FIG. A.

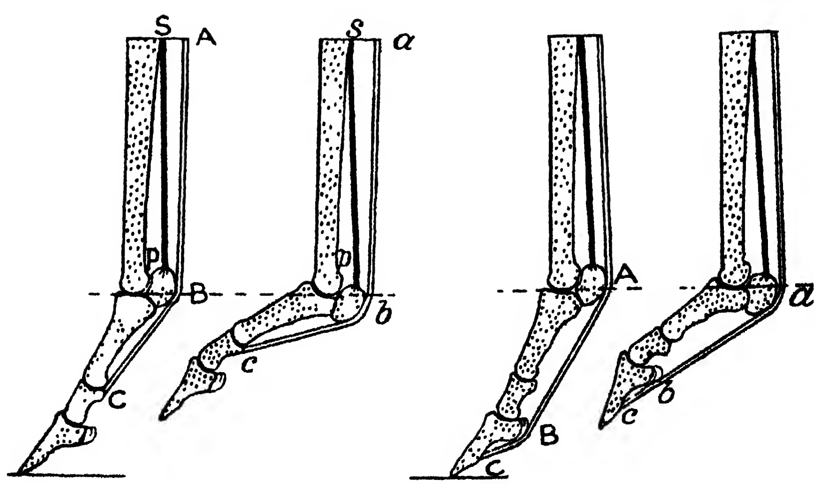


FIG. B.

of hyper-extension of the pastern during impulsion in fast work or in forced draught (fig. *a*, 4).

In the first stage of the support (fig. *a*, 3) some hesitation arises regarding the action of the perforans and sub-carpal and their escape from strain. The very limited relaxation of the perforans tendon at the coffin joint can hardly be sufficient to permit the angle of the fetlock to close to the extent seen in racing, when the ergot almost

touches the ground. The tendon is inextensible, and its apparent elongation when the fetlock descends should be conferred to the *muscle*. The sub-carpal ligament is not constantly tense, and it is reasonable to suppose that the perforans muscle is stretched before this ligament is called upon to share the pull on the tendon. In racing and similar fast paces muscles sooner or later become fatigued, and as they are not continuously contracted, when strain of the sub-carpal does happen at this stage, most likely the injury occurs during relaxation of the muscle, when the ligament, unassisted by muscular contraction, is in extreme tension.

Regarding strain of the perforatus the operation of the cause is not clear. At the fetlock this tendon moves freely on the perforans, and, according to Joly, with the advantage of having watched the action of the naked flexors in a living horse, the perforatus begins to move and comes to rest a little sooner than the perforans, which appears to continue the movement. The perforatus muscle is small, presumably weak and easily stretched, and the radial or check ligament is lax enough to allow for elongation under tension. No doubt partial rupture of this tendon sometimes occurs, but clinical observation suggests that the usual distension—"bowed tendon"—is gradually produced by repeated limited laceration of the peri-tendinous covering, and that later the body of the tendon becomes affected by extension from the peritendineum (paratendinitis).

Effects of Strain.—Coleman taught that sprain is "an inflammation of the cellular tissue connecting the perforatus and perforans together"; and Percivall, while holding that tendons are incapable of extension, and are too firm and strong to sustain hurt from common accident, recognized the fact that they are surrounded by a soft, delicate tissue, which must, every time they are forcibly pulled or stretched, be extremely liable to laceration. Since then—excepting those who perhaps too seriously interpreting the words of the preacher, "he that increaseth knowledge, increaseth sorrow," have been content with offering opinions—very few have taken the trouble to inquire into the nature of strain, and Pader, Veterinary-Major in the French army, has done more than any other to explain the pathology of tendinitis.

Excessive tension of a tendon causes rupture with retraction of fasciculi, laceration of the peritendinous covering and interfascicular septa, extravasation, and sero-sanguineous exudation. The exudate fills the interfascicular spaces and distends the areolar septa, the hitherto quiescent tendon cells increase in size and become active,

while the damaged fibres are partially converted into a structureless hyaline pulp. Inflammatory reaction is set up, and in the reparative process the breach in the tendon is made good by granulation tissue, which is formed by the agency of the tendon cells and the fibroblasts of the connective tissue adjacent to the lesion. Eventually the new-formed tissue undergoes cicatricial contraction. Though tendinitis, caused by strain, is an aseptic process it nearly always produces permanent distension at the seat of injury. Resolution is a possible termination, but in most cases of sufficient intensity to attract attention, repair is imperfect, and after apparent recovery it is exceptional to find the tendon normal or quite free from adventitious growth. As a rule there remains a nodular or diffused thickening of the tendon or peritendinous covering. A tendon once inflamed is predisposed to relapse, and too frequently, owing to insufficient rest, to position, or to persistent irritation the result is chronic tendinitis.

Post-mortem examination of a chronic or indurated strain of the sub-carpal ligament shows, in addition to remarkable intrinsic distension of the ligament, considerable peripheral increase from new formation of connective tissue. The suspensory lying in front is not involved, but the borders of the sub-carpal ligament are firmly united to the perforatus, and its covering by the enormously thickened aponeurosis. This union forms a tube for the perforans, which remains free with the synovial sheath. At the point where the sub-carpal joins this tendon, and below to a variable extent, the perforans is more or less distended, but above within the carpal sheath the tendon may be normal, atrophied, or hypertrophied, according to the intensity and duration of the inflammation, and the degree of compression exerted by the surrounding new fibrous growth.

Partial atrophy of the perforans may result from chronic inflammation of either the sub-carpal ligament or perforatus. Hypertrophy may be due to a compensatory cause, the perforans, owing to failure of the perforatus or one of the ligaments, being more actively engaged in supporting weight. But sometimes the increase in thickness is pathological and due to tendinitis, either primary or arising by extension from the sub-carpal ligament, perforatus, or aponeurosis. The metacarpal vessels and nerves running through the thick fibrous growth under stress of increasing compression may be injured, and in fact the wall of the metacarpal artery is much thickened, and the nerves, including the branch which crosses the perforatus, are expanded and flattened, but otherwise they appear normal. Sclerosis, arteritis, and phlebitis of the vessels, and sclerosis

and perifascicular exudation of the nerves, have been observed by Pader, and he suggests that possibly this interstitial neuritis may contribute to the lameness.

Similar peritendinous alterations with ultimate ossification of the fibrous growth occur in connection with chronic tendinitis of the perforans at the fetlock, usually of the hind limb. The rupture occurs between the sesamoids and the os coronæ, where the perforans is constricted and relatively weak. The tendon presents a diffused distension extending above the sesamoids, and forming a notable prominence behind the pastern. The synovial sheath and aponeurosis, inflamed and thickened, appear more seriously affected than the tendon. Some observers, probably impressed by the more obvious lesion, maintain that synovitis precedes the tendinitis; but Siedamgrotzky, after numerous investigations, held that in every case of chronic inflammation of the sesamoid sheath accompanied by lameness and tumefaction, the perforans has been partially ruptured, and that the synovitis is the result of extension from the tendon. *Post-mortem* examination of a chronic case does not reveal the order of attack. Both tendons and the synovial sheath may be affected, the perforans by distension, the perforatus by peritendinous increase, and sometimes the aponeurosis shows more extensive alteration than either the tendons or synovial sheath. In the fore-limb, at the perforatus ring, the perforans alone may be distended coincidently with inflammation of the sesamoid sheath. In this case the synovitis appears to precede the tendinitis, which invades the sesamoid surface of the tendon.

Tendinitis of the perforatus at the middle of the canon usually arises from a very limited initial injury of the tendon or the peritendinous covering. At first the leg is merely filled or œdematous over a portion of the tendon, and the lameness, not very marked, disappears with the swelling under rest and bandaging. Gradually, however, the tendinitis extends, the swelling becomes firmer and persists in spite of bandages and simple remedies. At this stage careful treatment may arrest the progress of the inflammation, but in most cases insufficiently rested the peritendinitis invades the aponeurosis, the borders of the perforatus become united to the subcarpal ligament, and permanent distension and adhesions extend far beyond the seat of primary injury.

In high strain and in strain at the fetlock the distension of the perforatus is complicated by synovitis of the carpal or sesamoid sheath, which always aggravates the lameness and retards recovery.

Here mention may be made of those cases of "diffused thickening of the flexor tendons" of one or both fore- or hind-limbs. The leg from knee or hock to fetlock is enlarged over the tendons by persistent, firm, not very sensitive swelling, without abrasion or lameness, and causing no inconvenience beyond raising the heels slightly off the ground. In this condition the tendons are not really thickened, but the aponeurosis and peritendinous coverings form a dense fibrous shield which appears to interfere very little with the movement of the flexors. What is the cause? Wear and tear, constitutional weakness, heredity, or what? Though sometimes referred to rheumatism, the alteration gradually produced is so painless in its progress and effects that one hesitates to accept this explanation. A more feasible answer may be found in the effects of excessive work, and probably the chronic peritendinous thickening arises from the stress of constant heavy traction in cart horses, and from jumping and prolonged galloping in hunters and other saddle horses.

In strain of the suspensory above its bifurcation the distension at first is lax and compressible, but as repair advances the injured part becomes harder. Its connective tissue covering participates in the inflammatory process, but the peripheral increase is less extensive than in flexor strain. The recessed position of this portion of the ligament and its separation from the sub-carpal and tendons by the aponeurosis and a connective tissue layer possibly explain the frequent escape of the tendons from invasion. But in strain of one of its branches the consecutive inflammation not only distends the suspensory but extends through the medium of the aponeurosis to the perforatus and lateral sesamoid ligament and produces one-sided chronic enlargement of the fetlock.

Parasitic invasion of the suspensory and perforatus has been observed in Austria, Russia, and the South of France. The parasite (*Filaria reticulata*) in excavating galleries causes the formation of painless nodular enlargement of the ligament, which may be mistaken for old-standing distension.

Filariosis of the suspensory has been investigated in Russia by Tchulovski, and in France by Pader, and a full description of the condition will be found in the *Journal of Comparative Pathology* for December, 1908. In one district Pader examined *post mortem* 43 horses, asses and mules, and found 35 affected in various degrees; and Tchulovski had 51 cases in 53 horses examined at Kazan. Apparently, while active, the parasites weaken the resistance of the suspensory and predispose it to strain or rupture. After a time the

parasites perish and the lesions are repaired, but the ligament remains more or less enlarged. So far the writer has not been able to find a suspensory with the parasite. In a few foreign-bred ponies the ligament of one or both forelegs has been found nodulated as in filariasis, but the cause could not be ascertained. In this country owners are not readily persuaded to sacrifice useful animals to gratify surgical curiosity.

Symptoms and Diagnosis.—The symptoms of strain being familiar, only a few will be referred to here. Diagnosis bristles with difficulties fully appreciated by the writer, who being himself unable to see clearly, can hardly show the way to others. Every strain is accompanied by the usual signs of inflammation, and soon after the injury, swelling, pain, and increased heat of the strained part are discoverable. These symptoms, as well as lameness, vary not only with the measure of the inflammation but to some extent with the position of the strain and the tendon or ligament involved. Lameness is more marked in sub-carpal or perforans strain than in strain of the suspensory or perforatus. Severe strain of the sub-carpal or perforans appears to be much more painful than other strains of equal extent or intensity. The horse walks lame and may be unable to trot. In strain of the perforatus ("bowed tendon") or suspensory, walking, may be free from nodding, and trotting may be comparatively easy. The difference in degree of the lameness exhibited in the two cases is due partly to function, and partly to synovitis, which is almost a constant accompaniment of perforans strain, and only an occasional complication of strain of the perforatus. Excepting an inch or two at the mid-canon and at its termination, the perforans tendon throughout is invested by synovial membrane, while the perforatus is only so covered in places. The horse's action may be suggestive, but in few cases does action alone warrant the diagnosis of strained tendon. Inspection of the lame leg, except in recent bowed tendon, may mislead, and a case sometimes occurs in which the exception should be disregarded to avoid error. Painful œdema over the tendons is helpful, but its many causes unconnected with strain should be considered. Manipulation of the injured region is most useful in forming an opinion of the nature of the case, and there is no better method of arriving at a differential diagnosis of the cord affected. In practice the advantage of distinguishing the strained from the unstrained tendon or ligament may not be very great, treatment varies very little, and often the diagnosis "strained tendon" is sufficient, and perhaps it is fortunate that the horse owner in this particular is not more exacting. Differential

diagnosis of many cases is extremely difficult and of some impossible, even after repeated examination of the leg. But bearing in mind that in most of the commoner strains the inflamed peritendinous tissues establish an intimate and more or less extensive connection between the tendons, a comprehensive view may be taken by anticipating probable extension of the tendinitis to parts which are neither distinctly normal nor yet clearly affected. In this way lies safety in diagnosis. The observer may be confident and fully justified in diagnosing strain of the subcarpal ligament and at the same time quite unable positively to state whether or not the perforatus or perforans is also implicated, but his experience of similar cases should enable him to affirm that the perforatus will not escape.

In diagnosing strain just under the knee, the sub-carpal, perforans, perforatus, carpal sheath, and the aponeurosis merit consideration.

Firm painful swelling near the canon and extending 4 or 5 in. downwards usually denotes, in the carthorse, sub-carpal strain, and in others strain of the perforans with synovitis of the carpal sheath. Superficial swelling extending upwards and distending the carpal arch generally arises from perforatus strain, and when the tumefaction is one-sided and very painful external injury may be the cause. Clipping the hair over the tendons facilitates further examination. By flexing the knee and tracing singly the ligament and tendons a centre of tendinitis will be discovered. Later, in a week or two, the inflammation having extended, while a diagnosis of strain can be safely made, uncertainty remains as to the cord primarily or mainly affected. In strain of the sub-carpal ligament at its junction with the perforans, the resulting distension appears to involve the tendon as well as the ligament, but *post-mortem* examination shows, at least in a few cases, that the lesion is restricted to the portion of ligament that is joined to the tendon. In young horses lame from high splint, œdema may extend to the adjoining aponeurosis and excite suspicion of flexor strain. Doubt will be satisfied by applying a bandage, which generally removes the swelling.

Strain of the perforatus at the middle of the canon may develop insidiously, or it may be shown by immediate conspicuous engorgement over the tendon. The slowly progressive case at first may be overlooked, because there is very little interference with function, but the other at once attracts attention. The horse is very lame, and the swelling, quickly formed, may have to be reduced before the nature of the injury can be ascertained. Usually the strain is severe and accompanied by acute tendinitis, which rapidly produces fusiform

deformity of the tendon with extensive peritendinous thickening. The progressive case begins by the formation of a warm, slightly painful, compressible swelling over the tendon. This may be attributed to a blow, but there is no abrasion ; though the absence of signs of contusion on a leg bandaged at work should not altogether exclude external injury as a possible cause. If arising from strain the œdema diminishes or disappears under bandages and re-forms when the leg is left uncovered. Lameness is hardly noticeable, and the horse may not be rested. In time, depending on the degree of injury and the horse's work or exercise, the swelling extends, becomes harder, and does not yield to lotions or bandaging. The tendon and its covering are inflamed, and short or elongated permanent distension will result. Owing to various causes, the horse is kept going, meanwhile peritendinitis extends, further laceration may occur, adhesions form, and eventually the condition of the leg and increasing lameness enforce rest and treatment.

Differential diagnosis of strain at the fetlock, fore or hind, is seldom easy. Occasionally, and only at the beginning, a case which appears to represent a flexor strain may be entirely due to synovitis of the sesamoid sheath, and as the perforans cannot long escape invasion, the cause of lameness may be puzzling. The condition of the inflamed synovial sheath hinders exploration of the tendons. Both flexors may convey the impression of distension, while only one is inflamed ; and in the chronic case paratendinitis (aponeurosis and synovial sheath) prevents intimate examination of the parts. Sometimes the position of the fetlock or the heels assists in the diagnosis of suspected flexor strain. Synovitis with knuckling, the foot resting flat on the ground, suggests perforans strain ; synovitis with raised heels points to perforatus strain, and paratendinitis or aponeurotic thickening ; and synovitis with knuckling and raised heels to tendinitis of both flexors. Firm painful swelling over the flexors below the the sesamoids usually arises from perforans strain, complicated by synovitis and paratendinitis, and much of the thickening or bulging behind the pastern proceeds from changes in the aponeurosis. In some cases there is distension of the inferior sesamoid ligaments.

Recent suspensory strain may be recognized very easily, but diagnosis of the chronic case of branch strain may be rendered very difficult owing to adventitious growth and adhesions. The affected ligament should be traced in the raised limb, and compared with a healthy one. Distension caused by strain is rapidly formed and always more or less diffused. Lameness varies, and considering the

condition of the ligament, it may be little marked. After rest and treatment functional recovery is the rule.

Prognosis of Strain.—The discussion of prognosis, in the absence of the horse, is unlikely to be profitable, and this part of the subject will be passed with the remark that of the various strains, considered functionally and economically, sub-carpal is the most serious. The others, placed in the order of diminishing importance, are perforans, perforatus, suspensory. This order should not be regarded as inflexible, but merely as the outcome of experience of average cases.

TREATMENT.—Treatment of a recent case comprises rest, which too often is ridiculously short and inadequate, raising the heels, warm fomentations to mitigate pain, ease tension, and promote absorption; douching with cold water, hosing the leg, or applying lotions of ammonium chloride, magnesium sulphate, sodium chloride, zinc acetate, alum, or lead subacetate, to remove congestion, lower local temperature, modify the inflammation and hasten absorption of the exudate. Ice poultices and continuous irrigation with cold water have similar effects, while warm moist compresses renewed every half-hour are strongly recommended by Möller, and dry uniform compression by means of cotton wool and bandages, by Hunting. A thick layer of a mixture of hard and soft paraffin containing white lead or finely powdered Epsom salt applied to the strain, and covered with cotton wool and a bandage, is said to be beneficial. Evaporating lotions, anodyne liniments and astringent paste are also employed; but probably encasing the shank with cotton wool held securely in position by an elastic or rubber bandage, and keeping the horse as far as possible at rest, will be found equally efficacious. The early treatment of an acute case continued for from four to ten days, or longer, lessens or removes the œdema, heat and pain, and isolates the firm, more or less extensive and still sensitive distension, which is now in process of repair. For some time the lesion remains apparently stationary, and though the preliminary remedies, supplemented by hand rubbing or massage may be continued, a cold water bandage, or a compress soaked in saturated solution of Epsom salt, applied to the leg night and day, may be found sufficient to prepare the case for more active treatment.

Massage as a therapeutic measure in human and veterinary practice was introduced by Girard, Veterinary Surgeon to the Imperial Guard of France in 1857, and its rational application to strained tendons has been explained by Waldteufel. He uses an antiseptic pomade composed of lard 250 parts, cresyl 10 parts, to

which water 100 parts is gradually added and thoroughly mixed to form a cream. After smearing the swollen part with the pomade, massage proceeds by very gently rubbing, from below upwards, all round the strain to unload the vessels, and to remove extravasation. Progressive pressure with the palm or the palmar surface of the thumb and fingers should then be applied to the strained or painful parts, and always in the direction of venous return. After rubbing for fifteen minutes or so the part becomes softer and less sensitive. Then the pressure should be stronger and the movements of the hand accelerated for a further fifteen minutes. Massage should be practised for half-an-hour once or twice daily according to the case, and in the intervals the leg should be bandaged. This treatment gives excellent results in cases associated with much œdema.

Stimulation or resolvent treatment is indicated in the stationary period while repair is taking place, or in two or three weeks after the accident, but some practitioners, immediately after diagnosis, apply a mercurial all over the strained region. The favourite agent is oleate of mercury or diluted mercurial ointment.

Fröhner recommends the treatment which he saw employed at the Imperial Stables, Vienna. After the usual preliminary applications to the strained part, the hair is clipped and the skin washed and disinfected, then biniodide of mercury ointment (1 to 4 or 5) is rubbed in thoroughly for fifteen minutes, and covered with absorbent cotton and an ordinary bandage, which are allowed to remain in position for two weeks. After twenty-four hours the bandage becomes moistened with exudate, which soon dries. By resorting to this method the application of the cautery to chronic cases may not be required.

Cagny, with a large racing practice in the treatment of strain, in place of vesicants and sometimes firing, employs subcutaneous injection of a drachm of rectified oil of turpentine, to which he adds a small proportion (1 in 50) of a 5 per cent. alcoholic solution of guaiacol, to render it aseptic and to diminish the pain following the injection. This method produces much additional swelling and frequently abscess formation, which, however, is seldom serious. He claims that the results are as good as those obtained from vesicants or firing, the leg is not permanently blemished, and this remedy is more easily applied than the cautery, but he admits that some horses are much agitated for several hours after injection, a few refusing to feed for two or three days, that the œdema may be so enormous as to prevent all movement for a week, and that it is slow in disappearing.

For perforatus strain, Joly, of the Training School, Saumur, in 1901, introduced the treatment by peritendinous insufflation of filtered air, followed by massage. The operation, carried out with due regard to antiseptic precautions, may be performed in the standing or recumbent position. A tourniquet is applied to the forearm. The air drawn through iodoform gauze is slowly injected by means of a Potain's aspirator furnished with a fine needle, which is pushed into the subcutaneous tissues over the distension on the posterior line of the leg. When the air has penetrated the healthy, œdematous or indurated tissues of the strained part, the needle is withdrawn and the puncture closed with collodion. Next day the insufflated region should be gently kneaded to drive the air, which tends to spread eccentrically, into the meshes of the inflamed tissues. Massage is repeated morning and evening at the most distended parts and finally the leg is douched with cold water. By this method, Joly states that the effects of peritendinitis are rapidly and radically reduced, and that the indurated centre of tendinitis is quickly isolated and often reduced as well. In fifteen days, in certain cases, the tendon has become perfectly cool, clean, insensitive, and resistant to the effects of work. Insufflation is useless for old-standing extensive indurations of tendons, but for cases passing into the chronic state repeated injections followed by massage or counter-irritation may bring about functional recovery.

Chronic strain cannot be cured, though usually an attempt is made by further treatment to render the horse workable. With owners and veterinarians cauterization is the favourite remedy, but perhaps it is less popular than formerly, and it cannot be described as a specific for strained tendons. Superficial firing, in lines or by budding, when useful at all is most successful in simple cases, but of the many strained tendons fired in this manner the advantage to the horse has seldom been very marked. Deep line-firing probably is more beneficial than any other mode of cauterization, but whether it acts by inducing the formation of a more extensive subcutaneous œdema or by merely exciting cutaneous inflammation with consecutive compression of the strained part, is not known. Firing in points, the needle penetrating the induration, has a very limited application. Pyro-puncturing may be justified on the assumption that it reproduces deep-seated inflammation and establishes a further process of repair and consolidation of the distension. But unfortunately for the success of this method, it promotes the formation of adhesions between the skin and subjacent tissues, and shortening of the tendon, disadvantages

that detract much from its value as a remedy for strain. Besides, deep puncture firing is dangerous where a synovial sheath exists, and an operation that may produce open synovitis should not be undertaken without due consideration. For perforatus strain at the middle of the canon and strain of the suspensory, puncture-firing is useful enough.

Neurectomy.—When other treatment fails, neurectomy should be tried. Frequently it is too long delayed. It enables a horse that has become useless from chronic strain to work moderately for a year or longer according to the case. But, like other treatment, neurectomy has its limits of usefulness. It does not arrest the tendinitis, which after operation may become aggravated. It does not prevent, while it may hasten shortening of the tendon, and in some cases it does not entirely remove the lameness, which is said to be mechanical. It is not advisable for saddle horses, and for heavy draught horses, while permitting profitable disposal, it does not give satisfaction. Notwithstanding these objections, neurectomy should not be neglected in suitable cases of chronic strain.

CONTAGIOUS GRANULAR VAGINITIS IN COWS AND STERILITY.

By STEWART STOCKMAN, M.R.C.V.S.[1]

Chief Veterinary Officer, Board of Agriculture, London.

I THINK it necessary to call attention to the above disease on account of its very contagious nature and the possible importance of its results.

The disease came particularly under notice during the course of the inquiry into epizootic abortion of cattle, and we have several times been consulted at the laboratory by members of the veterinary profession regarding it. It is not possible on the information available to express any very definite opinion about its prevalence, but our information is that it has become exceedingly frequent in certain parts of this country. It is not improbable that the disease has existed in Great Britain for many years, and that its apparently greater prevalence at the present time is due to a relation having been established between the more common but insidious chronic form without very evident external manifestations and the more noticeable acute form, which has led to the former being oftener

[1] From his Annual Laboratory Report for the past year.

looked for of late by manipulation of the genital passages, and owing also to the fact that it has lately been credited with causing sterility.

The disease is very prevalent on the Continent of Europe and in certain parts of the United States of America. In these countries it is said to produce epizootic abortion and be a cause of sterility in cows. With regard to vaginitis being a cause of epizootic abortion, we have excellent reasons, owing to the researches of the Board's Committee on the latter disease, for stating that abortion in this country is due to the bacillus of epizootic abortion. It is also established from the same source that sterility follows uncomplicated abortion in only a small minority of cases, and that the pure virus of epizootic abortion does not give rise to vaginitis when inserted into the genital passages. It seems not improbable that many Continental veterinarians have been led into error regarding the relation of contagious vaginitis to epizootic abortion, because both diseases are so exceedingly prevalent that they very frequently co-exist.

The inquiry carried on in Great Britain into epizootic abortion has certainly shown that it is not due to contagious vaginitis. With regard to vaginitis as a cause of sterility, it would appear from the writings of some distinguished foreign veterinarians that in their opinion the former is causally related to the latter. Some veterinarians are very positive on this point, and there seems to be no doubt that the two conditions may be found in association. That, however, is not necessarily sufficient to establish the relation of cause and effect between the two conditions, but I think one must grant, with fitting reserve made for the absence of accurate knowledge concerning the pathology of vaginitis, that there is some evidence to support the opinion that it may give rise to sterility. In connection with the inquiry into epizootic abortion in Great Britain, we met with herds which were reported by their owners to be affected with the latter disease, but which turned out on further inquiry to be affected with sterility, and no evidence of the existence of abortion was obtained. The sterility seemed to be gradually increasing amongst the females of the herds after the manner of a contagious but chronic disease. We possess practically no definite information regarding the prevalence and distribution of what for the moment might be referred to as enzootic sterility, and without wishing in any way to alarm the minds of stockbreeders unnecessarily, I think contagious vaginitis, and the very serious condition of sterility to which it is alleged to give rise, call for further investigation. It

has been possible to carry out a small amount of experimental and other inquiry in connection with vaginitis, but as the results merely touch the fringe, I do not propose at the present time to mention them in detail. I may say, however, that I have been unable up to the present to find any evidence that any of the various microbes isolated from the lesions is the cause of the disease, although it has been attributed to certain of them.

Symptoms.—The disease begins either in an acute or chronic form, but the acute runs into the chronic form, which usually lasts for months. In both forms the first symptom is redness and slight swelling of the external genital passage. In the acute form there is a certain amount of straining, and frequent passage of urine which seems to give pain. A mucous or muco-purulent discharge soils the external genital organs and the root of the tail. If the lips of the vulva be pushed apart the internal mucous membrane is observed to be very red in some parts, and covered at others by a greyish-yellow exudate. This form is probably what has for many years been known to farmers as "bull burn." It is the insidious chronic form, however, to which I desire more particularly to draw attention. Although it may be ushered in by an acute stage, its advent may be unaccompanied by objective manifestations, such as a discharge. In fact, a cow may be suffering from chronic vaginitis and remain unsuspected by the most careful of attendants. The lesions, however, are very visible if one takes the trouble to expand the external genital orifice. The mucous membrane is redder than normal, and on various parts of its surface one sees a variable number of small granules about the size of a pin-head. At first they are red. Later they become paler, and look rather like small blebs, but they are not really vesicular; on the contrary, they feel hard and solid to the touch, and they may persist for several months.

Method of Infection.—The disease only affects cattle. If a swab of wool from the vagina of either an acute or chronic case be placed in the genital passage of a healthy cow, it is often sufficient to set up the disease in the latter either in the acute or chronic form, and the lesions may be evident in about five days after infection. From this it would appear that the bull probably acts as a mechanical carrier of infection. The bull is also said to become infected, and so act more surely as a disseminator of the disease. The bull, however, cannot be the only way by which infection is carried, for heifers which have never been to the bull are reported to suffer from the disease, and in this connection it is worthy of note that the condition

spoken of as sterility is also reported to be met with in heifers when they are first taken into the breeding herds. It seems probable enough that animals may contract the disease from contaminated bedding and drainage, but further investigation may provide more accurate knowledge concerning methods of infection. At the laboratory I have seen several animals become simultaneously infected owing to their temperatures having been taken in the vagina, and the source of infection was traced to an unsuspected chronic case which had had the temperature taken first.

Prevention.—The only preventive measures which can be suggested at present are isolation of the affected, continual disinfection of their genital passages, and of the litter, drainage, and flooring. The genital passage of each animal should be examined for lesions, and a special bull might be kept for those found affected. The hands should be carefully disinfected after manipulating the organs of an affected animal. It is advisable that the genital organs of prospective new purchases be examined.

With regard to the bull, disinfection of the external genital organs is indicated, and in districts where a co-operative bull is kept, the attendant should be instructed to examine all visiting cows for lesions of vaginitis before permitting service.

I hope it will be possible to conduct further inquiry into this disease, especially in relation to its alleged connection with sterility.

TRICHINOSIS.

By STEWART STOCKMAN, M.R.C.V.S.[1]

London.

TRICHINOSIS is a disease of man and animals caused by a parasite called the *Trichina spiralis.* Human beings acquire the disease by eating the flesh of infested pigs. It is usually believed, however, that pigs in Great Britain are seldom carriers of the parasite. At least, if we are to judge from the number of clinical cases of trichinosis which occur in human beings in this country, it might safely be said that trichinosis of the pig is exceedingly uncommon. It is true, however, that several cases of slight infection of man have been found at *post-mortem* examinations in medical dissecting rooms, but owing to the small number of parasites found, the subject during life would probably never have felt anything more than slight

[1] From his Annual Report.

and local muscular pains, and the mildness of these attacks would depend on the small number of trichinæ in the flesh consumed.

So far as I am aware, there has been no outbreak of trichinosis sufficiently severe to attract attention in human beings in this country since 1871, when an outbreak occurred in Cumberland, and the pork, which was the cause of it, evidently contained a sufficient number of parasites to cause severe illness amongst the consumers.

The infected flesh contains larval *T. spiralis*, and when it is eaten by carnivorous animals the larvæ are set free from the muscle by the action of the digestive juices. When they reach the intestines they become adults and sexually mature. Each female gives birth to a large number of embryos, and the members of this second generation leave the bowel and are carried to the muscles in the blood stream. As one would expect, however, some of these larval forms are also excreted in the fæces of infested animals. The embryos, which invade the muscles, become coiled up and surrounded by a cyst wall formed by the tissues, and they may remain alive in this situation for a very considerable time. Animals may be infected not only by eating the flesh of other infested animals, but also by consuming other food which has been soiled by fæces containing the larval forms. It will be understood, then, how pigs may infect each other through their fæces. It seems probable, however, that the main factor in the up-keep of *T. spiralis* is the rat. These animals are very easily infected, and they are not infrequently in nature harbourers of the parasite. They may soil the food of pigs with their excretions while the parasites are in their intestines, or they may be eaten by pigs, and so give rise to disease in the latter animals.

In February, 1909, the Medical Officer of St. Thomas, Exeter, forwarded a portion of salted pig's flesh for examination to the Board, saying that on microscopical examination he had found in it what he thought to be the *T. spiralis*, and that a labourer, who had been consuming the flesh, had become very ill with what was thought to be trichinosis. On examining the specimen it was found to be badly infested with *T. spiralis*. One of the Board's Veterinary Inspectors visited the farm, and reported that the flesh had come from a sow which had been ailing for about two weeks before it was slaughtered. The sow was in good condition and fed well, but had shown great difficulty in using her hind quarters, so much so that she had even to be assisted to rise. On this account she was slaughtered, pickled, and used for food. Two people who consumed the flesh became seriously ill. The Inspector also reported that the farm premises were overrun

by rats, one of which he forwarded. The abdominal muscles of this rat contained a very large number of trichinæ. The rat was kept on ice for eight days, and was then used for experiment.

Experiment 1.—Small portions of the abdominal muscles were fed to white rat No. 1,018. This rat was found dead four days after eating the infested flesh. Adult trichinæ were present in the intestines, but no embryos could be found.

Experiment 2.—Intestines of rat No. 1,018 were fed to another rat No. 1,019. This rat also died four days after eating the intestines, and adult trichinæ were present in its large intestine. No embryos, however, were found.

Experiment 3.—White rats numbers 1,022, 1,023, 1,024 were fed upon the carcase and intestines of rat 1,019. The carcase was freely eaten, but the intestines appeared not to have been touched. Seventeen days after eating rat 1,019, numbers 1,022 and 1,023 were found dead. In the muscular part of the diaphragm of 1,022 encysted *T. spiralis* were found. Examination failed to reveal any parasites, however, in 1,023.

It is clear from the above observation that the muscles of the dead rat sent up from the infected piggery, contained living trichinæ. It also seems probable that the pigs became infested through the agency of diseased rats. It is, of course, a very difficult undertaking to keep a piggery free from rats. It is advisable, however, that pig-owners who cannot prevent rats invading their premises, should have the muscles of dead rats found on the place examined at intervals for the presence of trichinæ, since it seems to be the case that pigs in Great Britain, when they do become infected with this dangerous parasitic disease, owe the infection to the presence of infested rats. Amongst rats the disease is kept up not only by embryos from the intestines contaminating their food, but also by the cannibalistic habits of these vermin.

SPIROCHÆTÆ IN LESIONS AFFECTING THE PIG.

By J. A. GILRUTH, M.R.C.V.S., F.R.S.E., D.V.Sc.

Professor of Pathology and Bacteriology, Veterinary School, Melbourne University.

Skin and Subcutaneous Lesions.

The presence of these protozoan parasites have been already described as found in certain pathological conditions of the pig, notably by Dodd, as occurring in an ulcerative skin disease in the Transvaal,

transmissible by both contagion and by inoculation (*Journ. Comp. Path.*, 1906), and by Cleland in "castration tumours" of the pig in West Australia ("Parasitology," vol. i., No. 3).

Recently the occurrence of spirochætes have been observed by me in several lesions of somewhat diverse character in Victorian pigs, of which the following is a short description:—

In January, 1910, a pig's head was received from the Veterinary Department of the Victorian Government. It was affected with a large ulcerating tumour, the size of a fist, on the side of the cheek. The tumour was dense and had the characteristics of a fibroma. Unfortunately, no preservative having been used, putrefaction was somewhat advanced.

Microscopical examination showed throughout the structure of the tumour numerous spirochætes, the majority similar in size to those found in the fowl, but a number were much shorter than those usually found in avian blood.

As the owner advised that he had previously had three pigs similarly affected, and still had one showing a similar condition, Dr. Cameron requested him to forward it alive. It was duly sent, but unfortunately arrived during my absence on a holiday.

On arrival it was observed to be suffering from a hard swelling on the side of the left jaw, and a healthy young pig was placed in the same pen to test the possibility of contagion.

On my return to Melbourne it was found that the swelling on the left jaw had disappeared, but that the left knee was swollen and showing a small ulcerating surface just under the joint. Below this swelling was a caseous and necrotic area extending downwards about 2 in. and surrounded with chronic inflammatory tissue.

Smears from this showed numerous spirochætes and a mixed bacterial flora.

Attempts to transfer the condition by inoculation on scarified skin resulted in the production of a number of granulomatous, inflammatory chancroid lesions being slowly developed at, and in the vicinity of, the scarified area. These ultimately disappeared, but at no time were spirochætes detected, although microscopical examinations were frequently made. The granulomatous tissue appeared to be due simply to streptococci, which were present in large numbers.

The contact pig remained normal.

Recently I have had an opportunity of examining two cases of scrotal tumours similar to those described by Dr. Cleland, through the courtesy of Dr. John Robertson, Director of the City Abattoir.

Both pigs were in fat condition, about 18 months old, and I was informed the viscera of each were normal. At first glance the tumours had almost the appearance of normal testicles somewhat enlarged, being very prominently situated in the scrotal region subcutaneously. The skin was normal but for the scar where the wound by the castration knife had been made. In one case a tumour was situated in each scrotal sac, but in the other only one was present. On dissection the tumours, which were ovoid, slightly flattened, and of the diameter of a large orange, were found to be circumscribed, and fairly dense in consistency. On section the new growths were seen to be composed of fibrous but œdematous new connective tissue, enclosing a central irregular necrotic caseous area almost the size of a walnut, immediately around which the fibrous tissue was distinctly of a greyish dirty colour, strongly contrasting with the translucent homogeneous appearance of the peripheral mass.

In each case the spermatic cords at the distal end of which the tumours proper were situated were thickened, being about 1 in. in diameter, and contained several circumscribed caseous areas, varying from the size of a marble to that of a walnut.

Microscopical examination of smears of the central degenerated material from the terminal tumours showed many spirochætes similar to those already described, along with masses of various kinds of micro-organisms, such as cocci, long and short bacilli. Scrapings from the œdematous fibrous tissue showed also many spirochætes with numbers of bacteria, though few in comparison with those present in the caseous centre. The caseous nodules in the thickened cord while containing many mixed bacteria appeared to be free of spirochætes.

As to whether the spirochætes were the cause of the new fibrous growths under consideration is a question that requires further investigation, but the indications at least are that their presence conduces to the formation of the new fibrous tissue observed, while the central degeneration is probably the result of the bacterial invasion.

Sub-mucous Cysts of Large Intestine.

Spirochætes have been found by me recently associated with intestinal lesions of the pig, but apparently they were not the cause of any serious general disturbance.

The lesions were first observed in two young pigs received alive from the country for examination. The animals on arrival were very

lean, and though the temperatures were above normal, the appetite was good. The blood of each was normal, so far as erythrocytes were concerned (7,500,000 to 8,000,000) but there was a definite increase in leucocytes (50,000), chiefly eosinophiles.

During the succeeding three days, as the condition was rapidly improving and no definite symptoms could be detected beyond a slight fluctuation in the temperature, one was slaughtered for examination, and the other a week later, when it was obvious a very decided improvement in appearance had taken place, these facts alone pointing to some neglect or dietetic error having been the cause of the poor condition.

The first pig killed showed a definite pathological condition of the large intestine. The mucosa of the cæcum was affected for about an area of eight inches with patches of inflammation covered by diphtheritic false membrane. The large intestine throughout its whole course showed numerous circular, flattened, greyish nodules, each about the size of a small pea, there being about two to four present to the square inch. These nodules were distinctly observable without incising the bowel, and caused some projection of the serous covering. On examination of the mucous surface slight circular elevations were observed corresponding to these nodules, the majority showing a minute central depression, through which the contents could be readily squeezed. These nodules were apparently cystic in nature; in some instances the contents appeared translucent, jelly-like, and not readily broken down, with a small greyish, caseous centre; in others the contents were completely caseous.

On microscopical examination the material was seen to consist chiefly of fibrinous *débris* with pus cells and some columnar epithelia. A peculiar feature of the less degenerated contents was the presence in smears of a finely laminated membranous structure, as if part of a parasitic cyst wall. Stained by Giemsa's method myriads of beaded bacteria of varying length, cocci, and bacilli could be detected, but, in addition, especially in the "laminated" membrane, could be seen many delicate spiral organisms with all the characters of spirochætæ. These were so regular and so numerous in the "laminated" structure which was comparatively free of bacteria that there seemed to be some decided connection. It should be observed that in the fresh state no definite movements of the spirochætes could be observed, and that there were always some cercomonas, actively motile, found present.

Sections of the intestinal wall demonstrate these nodules to be of

the nature of small cysts of the deeper glands laris mucosæ, and apparently all are more or able irritation is evidenced by the accumul some formation of new fibrous tissue, with wall, at the periphery, while the centre material with shed epithelial cells and more morphs. Masses of bacteria, chiefly bacilli in staining, can be seen present amongst the cells

It may be noted that a young pig about six placed in the same pen as these pigs, develope with capricious appetite ten days later, and teenth day, as it was evidently recovering fr *mortem* examination disclosed a broncho-p areas of degeneration (caseous) which was indisposition. In addition, however, on ex membrane of the large intestine a number of nodules, similar but smaller in size to those above described, were observed. They were not visible on the serous surface and none were degenerated; all showed the central depression and contained a gelatinous material, amongst which bacteria as before, and a few cercomonas, could bè demonstrated, but no spirochætæ.

That these nodules were not induced by contagion from the previous cases was proved by the fact that a control from the same r which had remained in good health, killed ten days later, was cted with similar nodules. These again contained no spiro- many bacilli and a few cercomonas.

ssumed, therefore, that whatever may be the patho- of these nodules or cysts (obviously not great), e to the bacterial invasion, the presence of ents was probably accidental.

vo pigs were any metazoan parasites was made throughout the whole of efore be concluded that the definite probably due to the spirochæte scribed.

NOTE ON THE EXISTENCE OF SPIROCHÆTOSIS AFFECTING FOWLS IN VICTORIA, AUSTRALIA.

By J. A. GILRUTH, M.R.C.V.S., F.R.S.E., D.V.Sc.(Melb.).

The fowl tick (argas) has been recognized as an exceedingly troublesome skin parasite of the domesticated fowl in certain parts of the northern districts of Victoria for a number of years past, and its association with a febrile condition, especially in young birds during the summer months, has, it would appear, been commonly observed, although as far as I can gather, beyond some short paragraphs in the daily press (until the last month when an article by Dr. A. A. Brown appeared in the *Journal of Agriculture*), no definite scientific observations have been placed on record. This is rather surprising in view of the fact that the Deparment of Agriculture, I am informed, has for some years been endeavouring to prevent the spread of the tick to other districts.

Soon after my arrival in Melbourne at the commencement of last year I was informed of the existence of the "so-called tick-fever" in certain districts. Seeing that since 1903, when Marchoux and Salimbini first described the presence of a spirochæte in the blood of Brazilian fowls affected with the tick argas, other observers in India, Sudan, Rhodesia, Bulgaria, and elsewhere have also demonstrated the connection between the two parasites, I was naturally anxious to ascertain if in Australia, along with the tick as a skin parasite, the spirochæte was also associated as a blood parasite. I found it, however, impossible to secure a tick-infected fowl during the past summer.

Since then Dr. S. Dodd, Chief Veterinary Officer and Bacteriologist to the Queensland Government, in his last annual report describes fully the disease Spirochætosis as affecting Fowls in that State, and has demonstrated its transmission by the common fowl-tick *Argas persicus*.

Through Dr. Brown of the Agricultural Department at the request of the Minister for Agriculture I received on January 22 a live fowl presenting the following definite symptoms: General dejection, somnolence, ruffled feathers, comb pale, slight diarrhœa, and loss of appetite. Only four ecto-parasites were to be found on the skin and these were apparently all larval forms of a parasite of the argas type, and were handed to Dr. G. Sweet for identification. Dr. Swift has described these as belonging to a new species *A. victoriensis*.

Examination of blood smears made in the usual way, fixed in alcohol and stained with Giemsa's stain, gentian violet, &c., demonstrated considerable numbers of the characteristic spirochætæ as described by Marchoux, Laveran, and others. There was also a marked increase in the number of eosinophile white blood corpuscles.

The spirochætæ increased in number till the time of death fifty-six hours after arrival. *Post-mortem* examination did not disclose any decided pathological change, and the spleen was not enlarged.

Inquiry from Dr. Brown elicited the information that the bird had been sent from a non-infected to an infected district, and there exposed to the ticks only six days prior to being forwarded to me, which indicates the rapidity of the infection.

A live fowl was inoculated subcutaneously with 5 drops of blood from the heart of the first fowl a few minutes after death. No swelling developed at the seat of inoculation. Spirochætes were found in the peripheral blood on the third day but only in one to every twenty fields of the microscope. On the fourth and fifth days the numbers increased greatly and several could be seen in each field. On the sixth day, however, extremely few could be detected, while subsequently none could be seen. The animal remained in normal health. The disappearance occurred without any preliminary clumping and no intracorpuscular bodies of Balfour's "after phase" could ever be determined.

Careful examination of smears from the naturally infected fowl, it should be noted, failed to detect any bodies within the red blood corpuscles such as described by Dr. A. A. Brown in a recent number of the *Victoria Journal of Agriculture.*

Intracorpuscular forms of spirochætes have been described by Balfour [Third Report, Wellcome Research Laboratory, Sudan] as constituting the "after-phase" of spirochætosis. These bodies were only found in animals which recovered, and he regards them as a definite stage in the life history of the blood parasite. Von Prowozek has recorded somewhat similar intracorpuscular bodies in fowl spirochætosis. Dodd, however, in his Queensland experiments failed to demonstrate such bodies in any of the recovered fowls. My examination of the blood, in which the spirochætes disappeared so suddenly also failed to detect any similar bodies to those described by Balfour.

Clinical Articles.

HYGROMA—BIER TREATMENT.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A valuable brown, weight-carrying hunter gelding, aged 5.

History.—A little over twelve months ago a small postero-internal swelling appeared just below the knee, without causing lameness. It was blistered without effect, and the swelling had been increasing in size ever since. Three or four veterinary surgeons had seen it and considered it best to leave it alone.

Symptoms.—A swelling of the same consistency as a chronic bursal enlargement with fairly thickened walls in which fluctuation could be detected, situated just below the knee at the postero-internal aspect of the limb, involving the inner aspect of the flexor tendons; painless to the touch and not causing lameness. Its size was about that of a hen's egg. Pressure on the swelling did not cause a distension to the outer aspect of the tendons but caused a bulging above and behind the knee, not in the position of distension of the carpal sheath.

Diagnosis.—A hygroma or cystic collection of serum beneath the skin, or possibly a distension of portion of the carpal sheath which became partitioned off from the remainder.

Prognosis.—The swelling might continue to increase in size and eventually interfere with free flexion of the knee. Blistering or line firing not likely to be beneficial, but needle point firing might have a good effect. Opening, evacuating and injecting with tinct. iodine likely to have good result.

Treatment.—Having explained to the owner the possible danger of opening the carpal sheath, and had the animal insured, cast him, injected cocaine locally, and opened the swelling at its lowest point. A quantity of blood-tinged serum escaped. On exploring the cavity it was found to extend for a distance of above 3 in. above the lower end of the radius, and its lining was found to be infiltrated with calcareous material. I injected the cavity with tinct. iodine and inserted into it a pledget of gauze saturated with tinct. iodine. The subsequent treatment consisted in syringing with tinct. iodine, but after three weeks of this treatmeut the cavity showed no signs of healing, and its orifice assumed an ulcerous appearance. I then rubbed powdered zinc sulphate all over its lining. This caused pain, lameness

and swelling which disappeared after a few days, but still the sinus persisted. I tried iodine again for some days without avail, and afterwards injected 5 per cent. zinci. chlor., which also failed to have the desired effect. I was afraid to use hydrarg. perchlor. in powder for fear of causing a too deep slough, and thus exposing the carpal sheath. I felt sure that opening up the passage would be followed by healing, but I did not wish to make a large wound at the back of the knee; consequently I resolved to try the hyperæmic treatment. I applied a rubber tourniquet above the knee fairly tightly but not so tight as to arrest the arterial circulation, and left it on for three hours, repeating this for two days in succession. This treatment caused a large inflammatory swelling about the knee which was very painful, making the animal extremely lame. I then allowed a couple of days to intervene before applying it again, and then left it off until the swelling subsided, when I found that the passage had become smaller, seeming to have closed in at the sides, and that the discharge was considerably diminished. I then allowed the horse to be taken home and turned out to grass, instructing the owner to apply the band occasionally in the way I demonstrated to him. The owner informed me afterwards that he used the band, he did not say how often, perhaps once or twice, and that the condition continued to improve after he had taken the horse home, and the cavity soon closed up altogether. Considerable thickening remained, but the horse went sound again, and the cystic condition was got rid of. The case was disappointing as it was three months under treatment, but it showed the efficacy of the Bier treatment after other methods had failed.

CYST IN THE SINUSES OF A COLT.

By Professor J. J. O'CONNOR.

Dublin.

Subject.—A strong yearling cart colt in good condition.

History.—Six months previously to my seeing the colt he had a slight discharge from the nose which the owner thought was the result of a cold, but it persisted, and the following symptoms gradually developed.

Symptoms.—A fairly copious mucoid discharge from the right nostril, a loud respiratory noise, a large swelling over the frontal and superior maxillary sinuses, and over the level of the fangs of the superior molars, and a thin-walled cyst in the right nasal passage,

which could be felt with the tip of the finger passed in through the nostrils. Dulness was not evinced on percussion over the sinuses.

Treatment.—Cast the colt. On examining the cyst in the nose it burst and discharged a reddish glairy fluid. I made three trephine openings, one into the uppermost part of the frontal sinus, one into its lowest part, and one into the superior maxillary sinus. The same kind of fluid as was present in the nasal cyst escaped from the sinuses, it was inodorous. I washed out the sinuses with an antiseptic lotion. The subsequent treatment consisted in irrigating the sinuses daily with an antiseptic lotion, chinosol or lysol, the openings being prevented from closing by pledgets of gauze. After about a fortnight of this treatment the condition seemed little improved except that the breathing was not so noisy, on account of the cyst in the nose having ruptured. I therefore cast the animal again, and made all the openings much larger by breaking away pieces of bone with the bone forceps and chisel and mallet, so that I had a clear view of the interior of the sinuses, a great part of which was occupied by loculi composed of soft spongy bone and embryonic fibrous tissue, which I removed with the curette. I then packed the sinus with gauze saturated with tincture of iodine. Afterwards daily treatment consisted of flushing out the sinuses with lysol solution, irrigating with tincture of iodine, insufflating with iodoform and boric acid, and plugging with gauze wrung out of tincture of iodine, pure or diluted with two parts of water. Under this treatment the condition gradually improved, and after four or five weeks the lining of the sinuses assumed a pink, healthy appearance, the discharge ceased, the swelling on the face greatly subsided, and the respiratory noise disappeared. The case appeared to be cured, the holes were allowed to close, and the colt was sent home to the country. Three months afterwards the owner said he was doing well.

Eight months after his discharge the colt was sent to me again, showing the same symptoms as before, and I opened the sinuses in the same places and found them quite full of the same kind of fluid. In addition, I made an opening into ths nose from the lower part of the frontal sinus. On the second day after the operation the animal showed all the symptoms of acute continuous colic, and in spite of the usual treatment he died in the course of a few hours. *Post-mortem* examination was disappointing as regards revealing a cause for death. The only abdominal abnormality found was a small chronic abscess in the mucous membrane of the stomach, and

slight impaction of the colon. There was no inflammation of the brain or meninges. The whole carcase became rapidly emphysematous after death.

A DISEMBOWELLED CALF; OPERATION AND RECOVERY.

By E. RYAN, M.R.C.V.S.

Strokestown.

I was called one morning to a case of parturition in a Shorthorn cow, and upon arrival found the owner had just removed the calf, breaking off the umbilical cord so close to the abdominal wall that the latter had been torn rather badly. The wound thus made was fully 5 in. in length, and a bunch of intestine, quite as large as a football, was protruding. As the calf was lying on the floor of the byre, and this was very dirty, they were already much soiled, so that I thought that by far the better plan would be to destroy the beast at once. At the request of the owner, however, I decided to try and return them. After washing with lysol and water I got them back into the abdomen and sutured the wound with a continuous suture of chinosol tape. The bowels were very much soiled, and I am quite sure that I did not get all the material off, but to my agreeable surprise the calf made an uninterrupted recovery. In fact, it behaved in such a way that had I not known of the accident I should never have suspected, when I saw the calf a couple of days later, that anything had ever happened to it.

A CASTRATOR'S ERROR.

By JNO. L. PERRY, M.R.C.V.S.

Cardiff.

In the early part of September, 1908, I received a letter asking me to attend a cart horse, aged 3, upon which an attempt at castration had been made by an unqualified man three days previously.

The owner said in his letter: "When the operation was done, I was present and saw one testicle taken away with clam and hot iron as usual. The castrator, a man who does all that kind of work about here and has hitherto been most successful, then 'bunched' up something in the clam. I saw, at once, it was not a testicle, and told him

so. He, however, persuaded me that the colt was malformed, and that it was the other testicle all right. I, however, left in disgust, and learnt afterwards that he had at once proceeded to sear through this 'something' with the hot iron. Immediately this was completed about 12 in. of penis fell from the horse's sheath to the ground. So he had amputated the penis in mistake for a testicle! Being thus convinced of his error he then found and removed the other testicle. The horse is now very weak and eats but little, his sheath is a tremendous size, like a sack of potatoes."

I was away from home at the time, so Mr. C. E. Smith, M.R.C.V.S., saw the horse in my stead. He found the sheath almost justified the description given it by the owner of the horse. It was engorged and pointing in places with infiltrated urine. After casting the animal and well lubricating the inside of the sheath with vaseline, he discovered, after a lot of tedious manipulation, the mutilated end of the penis about a foot away from the natural opening of the sheath. The swelling being so severe, the urine could only come away in a small dribble, so he decided to make an opening for the penis stump to come through the sheath in a position close to the proper castration wounds. The urethra protruded about $\frac{1}{8}$ in., but it was impossible to get a skin attachment for it: so it was left as it was with the intention of completing this part of the operation later on when the swelling had subsided. Punctures were made in various parts of the sheath to allow the urine which had infiltrated into the surrounding tissues to drain away. All the parts were thoroughly cleansed with warm antiseptics and then dressed with carbolized vaseline.

All this took a long time, and when the horse was allowed to rise he was terribly "done up," but soon revived after a stimulant in the shape of half a pint of whisky, which, by the way, the owner parted with very reluctantly. As the farm was twenty-seven miles away, the owner said he would send word as to the horse's progress. This he did, saying there was "daily improvement."

I saw the case myself ten days afterwards. The sheath was slightly swollen; horse eating and improving in condition. Standing behind him and pulling the tail aside I could see about 4 in. of penis hanging through a wound in the sheath, and in position just where a mare's teats would be. The penis pointed downwards and backwards, and when urination took place there was a stream about the callibre of a clinical thermometer case directed upon the points of the hocks. The urethral opening was clearly diminished in lumen, and I told the owner that the horse should be cast again, and a further small portion

of the penis removed so that the urethra could be properly everted and stitched back to avoid a further stricture. This he would not consent to, preferring to "wait and see" how the horse went on.

I was not asked to attend the horse again, but being in the locality a month or two afterwards saw him at grass. Both hocks were then in a terrible mess, due to the constant dribbling of urine upon them. The urethral opening was evidently very small, as one could see the urine coming away from the penis in a very fine spray. Owner still refused surgical interference. I wrote him about twelve months ago on another matter, and asked him how "Farmer" was going on, expecting to hear he had been sent to the kennels. His reply was, "Horse working on farm regularly, and except for requiring an occasional drench goes on all right."

I might add that I tried at the time to persuade the owner to institute proceedings against the castrator, either for cruelty or in a civil court, but this he would not do, the reason being, as I learnt afterwards, that he had arranged terms for the castrator to pay him the sum of £25 in instalments, as damages. This would, of course, account for his desire to avoid further expense or publicity. He wanted the matter kept quiet till the money was paid; hence also his employing me in lieu of other veterinary surgeons nearer his home.

ADENO-CARCINOMA OF THE LUNG, WITH SECONDARY GROWTHS, IN A COW.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.

Professor of Veterinary Pathology, Melbourne University.

An interesting report of this case, along with specimens for microscopical examination, was received from Mr. W. T. Sabin, Government Veterinarian, who is most assiduous and careful in noting unusual pathological conditions. The animal was a Jersey cow, aged 8.

History.—The cow, then in good condition, was attacked with milk-fever after calving, in November, 1907. She recovered under treatment, but remained dull and weak. Atrophy of the muscles of the forelimbs developed, but this was considered due to injury received when she was suffering from milk-fever, it having been deemed necessary to drag her some distance to a convenient and sheltered place. Her milk, which was abundant, was, however, given to her calf, as it was obvious the cow was not in health. Later on,

tuberculosis being suspected, she was tested by Mr. Kerrigan, but there was no reaction; the result, nevertheless, was considered doubtful, as her initial temperature had been abnormally high. Finally, general weakness became so marked that she was unable to rise, and the owner destroyed her as hopeless on July 22, 1908.

Post-mortem Appearances.—A *post-mortem* examination was made by Mr. Watt, Assistant Meat Inspector, who, finding unusual lesions in lungs and kidneys, communicated with Mr. Sabin, and he, after visiting the place and carefully examining the affected organs, reported as follows :—

The general condition of the animal was poor. The lungs showed no growth externally, but the left lobe was enlarged by a visible swelling. On section of the lung a dilatation of a bronchus was opened, and a portion of new growth became visible, forming part of the wall, appearing as a smooth yellowish surface, not ulcerated, but apparently covered by normal mucous membrane. The swelling was found to be due to a tumour with circumscribed periphery, ovoid in shape, about 5 in. long and 3 in. in its narrow diameter, fairly dense, and fleshy in consistence. The appearance of the cut surface was yellowish, with irregular whitish fibrous bands throughout, and here and there areas of degeneration (colloid). Scattered through the substance of both lungs were smaller, more spherical, areas, probably secondary, which were homogeneous and yellowish on section. The mediastinal gland was enlarged, about two-thirds of its substance being occupied by a new growth similar to the secondary tumours in the lung. The kidneys were also metastatically affected. In one were several globular tumours from 2 to 3 in. in diameter, coalescing at points, and numerous smaller areas, varying from the size of a pin-head to that of a pea, the greater part of the normal tissue of the organ being replaced by the new growths. The other kidney was also affected, but the tumours were fewer in number, about half the organ being replaced, however, by the new growth. The larger tumours were visible on the surface as slight nodular projections of a yellow colour. It was not until section had been made that the full size of any nodule was disclosed. The consistence was fairly dense, the colour a homogeneous pale yellow, and almost caseous-looking. Each nodule was spherical, and definitely circumscribed by a thin, fibrous false capsule.

Mr. Sabin formed the opinion that the disease was a form of cancer, the large tumour in the lung being the primary growth, the others, as well as those in the mediastinal gland and the kidneys, being secondary. The fact that the large tumour of the lung alone

showed on section visible bands of fibrous tissue, and also areas of degeneration, supported the conclusion; and microscopical examination of sections confirmed it as far as was possible.

Microscopical Examination.—The large new growth in the lung presents under the low power a distinctly lobular appearance, similar to that of a secreting gland. The lobular areas are irregular in size and contour, and are separated by bands of fibrous tissue. Under higher powers these lobules are observed to be comprised of more or less cubical epithelial cells, generally arranged as solid processes, of irregular thickness, aud sometimes branching, but here and there they line as a single layer of cubical cells very definite acinous or alveolar spaces. The fibrous stroma is comparatively scanty throughout the new growth, unless in the bands dividing the larger lobules, or groups of lobules, and at the periphery of the neoplasm where it forms a a false capsule.

The secondary growths found in the lung and mediastinal gland do not show so definite a lobulation, though it is still present. The general arrangement of the epithelial cells, including the occasional alveolar distribution, is, however, similar.

The secondary growths in the kidney show no lobulation, and no alveolar formation. There is little stroma. At the periphery there is a distinct false capsule, formed by a new fibrous tissue, which is seen invading the parenchyma, causing atrophy and marked distortion of the glomeruli and the tubules, but there is no infiltration of the renal tissue proper by the new epithelial growth.

AN INTERESTING SPLEEN, THE RESULT OF STRANGLES.

By JOHN VARNEY, M.R.C.V.S.

Winslow.

Subject.—Bay gelding (hunter), aged 4, 16.1 in. height. Examined for soundness May 4, and passed sound, in the course of a few days he commenced to cough, with nasal catarrh and acute laryngitis, accompanied with a very high temperature (106° F.). With the usual treatment the animal apparently recovered in three weeks, showing no symptoms of complications or sequelæ. The horse was ridden and did his work for a fortnight.

May 25.—I examined a chestnut gelding (arrived on the same premises a day or two previously) for soundness, but I found he had

a slight discharge from the nose, accompanied by a sore throat, and knowing that the other horse had been so ill, I held the certificate over. This horse developed similar symptoms to the other horse, and recovery took place in about three weeks. At the same time a yearling developed similar symptoms, accompanied with strangles; this animal recovered.

June 15.—Another horse, a bay hunter gelding, was observed to have a cough, with nasal discharge, acute laryngitis, temperature 104° F., and slight swelling of the submaxillary glands. In the course of three weeks five or six abscesses formed and broke, and discharged in the usual manner, in the submaxillary and parotid region. This case, I consider, was remarkable for the enormous quantity of pus, mucus, and saliva which continually came away for at least three weeks, the manger, rack, and boards having to be cleared off and disinfected three times a day; in fact, it was so great that we removed the horse to an isolation box.

After July 5 the discharge appeared to decrease, and the horse appeared to be on the way to recovery, as no other abscesses showed themselves. However, he did not improve to my satisfaction in the next week, the temperature rising and falling, more discharge some days than others, and the whole time losing flesh and condition, although milk and eggs were taken freely three times a day, also small quantities of old hay, new hay, and vetches, and he would eat about a quart of crushed oats and bran with chaff in the twenty-four hours. However, debility and emaciation increased, so that the horse could hardly walk about, temperature during this time being a little over 102° F., and the pulse 60.

July 22.—Horse much worse. Temperature 104° F., pulse 75, very weak, slightly accelerated breathing, and other symptoms pointing to a fatal termination, and, as I had informed the owner some fortnight or three weeks ago, the probability of an abdominal abscess.

I should like to say that, during the whole of the horse's complicated illness, pulmonary symptoms were never predominant or asserted themselves above others, the lower portion of both lungs appeared consolidated, and applications of strong liniment had been applied to the throat two or three times. I had remained in the box with this horse several times alone from ten to fifteen minutes, and particularly noticed him lifting up first one hind leg and then the other towards his belly, with a corresponding twitching movement of his tail, indicating slight abdominal pain, afterwards throwing his head right up with a groan and deep sigh; moving listlessly round, and going

through the same symptoms again, after which he would commence to feed again. He often lay down; there was no trouble with the bowels or kidneys except the last few days, when the urine appeared almost black, but in fair quantity.

The appearance of the patient became markedly altered; the face was drawn and haggard, the whole expression being anxious, and the skin distinctly "hidebound." At this stage he was seen in consultation by Professor Hobday, who, thinking that there was fluid in the chest and consolidation of lung tissue, advised an exploratory puncture with trocar and cannula. This was done on each side in the usual situation, but only a small quantity of blood-stained fluid followed, and within three or four minutes the horse collapsed and died quietly, almost without a struggle.

The *post-mortem* examination was most interesting, especially in regard to the organs in the abdominal cavity. The spleen was enormously thickened and enlarged, weighing 37 lb., and being adherent to the abdominal wall, to the diaphragm, and to the stomach. Between its upper end and the stomach there was a strangles abscess almost as large as an ordinary football, containing very offensive pus, and in the front portion of the thorax there was another abscess as large as a fair-sized pine-apple. The lungs were congested and consolidated in places, and there was a small quantity of blood-stained fluid in the chest.

Remarks.—The case is of particular interest on account of the enormous size of the spleen, the size of the other internal abscesses, and the way the poor beast lingered on under such conditions without exhibiting worse constitutional symptoms.

OVARIOTOMY IN A MARE.

By J. J. O'CONNOR.

Professor in the Royal Veterinary College of Ireland, Dublin.

Subject.—A good bay cart mare, aged 9, in good condition.

History.—The mare was an inveterate kicker in harness and eventually the vice became so bad that she could no longer be used. As the result of the constant kicking her tail became badly damaged against the front of the cart, being affected with a large suppurating contused wound.

Treatment.—Having thoroughly disinfected the tail and vagina, removed the diseased portion of the tail with the docking knife, I

performed ovariotomy. The result was very satisfactory, as the mare afterwards became perfectly quiet, working steadily in harness without kicking.

FIXATION OF THE PATELLA IN A HEIFER.

By Professor J. J. O'CONNOR.

Dublin.

Subject.—A six-months-old Jersey heifer.

History.—Had been found one day lame in the near hind leg, which was carried extended backwards.

Symptoms.—Extension of the stifle and hock joints of the near hind limb, the toe barely touching the ground. The patella was firmly fixed above the trochlea of the femur.

Treatment.—(1) Tried in vain to dislodge the patellà by external manipulations. (2) Cut the internal lateral ligament of the patella, an operation which Cadiot says always permits of reduction, but in this case it was without effect. (3) Cut the vasti and rectus femoris muscles at their insertion into the patella without having any effect on the latter, which seemed anchylosed in its new situation. But this operation improved the gait considerably, the animal being able to put her foot flat on the ground.

AN INTERESTING MONORCHID.

By FREDERICK HOBDAY, F.R.C.V.S.

Kensington, W.

The patient, a chestnut cart gelding, 2 years old, was one of three cryptorchids presented for operation, in consultation with Mr. T. Stainton, M.R.C.V.S., of Reading, on June 14 last. All were abdominal "rigs," and all showed peculiar features. The testicles in the other two cases were found and removed, each eventually making an uneventful recovery, but the chestnut was of especial interest as it proved to be a true monorchid. There was no evidence or history of any prior attempt at castration; in fact, it was known with certainty that no testicle had ever been removed. The left one was present in the scrotum and was removed without any trouble. On the right side the abdomen was penetrated in the usual situation, close to the inguinal ring, and a careful search revealed not only the absence of testicle, but a gradual merging of the end of a rudimentary cord into the lining of the peritoneum of the pelvis. After making sure

of this fact, by tracing it repeatedly, the hand was withdrawn and the inguinal canal carefully closed by sutures. The colt was allowed to come out of his chloroform, and got up apparently none the worse for his experience. This was about 5 o'clock. At 10.15 p.m. the animal was heard to be making a noise in the box as if in violent pain, and upon examination the bowels were found to have descended. The weight had ruptured one of the sutures and a loop of bowel had come down nearly as far as the hocks. Assistance was summoned, and after considerable difficulty the colt was cast and the bowel returned. As much washing and disinfecting was done as was possible under the circumstances, and a plug of cotton wool was inserted. This was inserted (according to Mr. Stainton's idea) in a very ingenious manner underneath a row of sutures, and then followed by a second row of sutures, in such a way that the pad could be changed without danger of allowing the bowel to escape, the first layer of sutures not being touched or interfered with in any way.

On the following morning the colt's temperature was 103° F., and during the subsequent days it varied been 102° and 103° F. The pad of cotton wool was changed on numerous occasions, and febrifuges, tonics, or stimulants were administered internally at discretion. Antistreptococcic serum was also given.

Peritonitis was evidently present and in spite of all efforts, death eventually took place on July 15.

A *post-mortem* examination at which Dr. Kendall, D.V.Sc., M.R.C.V.S., and Mr. Benson, M.R.C.V.S., in addition to Mr. Stainton and myself were also present, confirmed the absence of any testicle on the right side, nor was there any evidence of such an organ ever having existed, the spermatic cord being clearly traceable and merging imperceptibly into the peritoneum of the pelvis. Such cases are rare, and are worth recording. I have already reported a similar case in my little brochure upon "Cryptorchid Contraction," and a further still more curious point in which both testicles were absent.

The remainder of the *post-mortem* examination was only of interest in connection with the peritonitis. The loop of bowel which had descended was matted together, and there was a long abscess between the two portions of the loop. This contained a piece of dirty straw which must have been overlooked, as it quite readily might have been, when the bowels were washed and returned.

On the left side the end of the cord from which the testicle had been removed could be found quite easily, and had nothing about it upon which to make any comment.

Canine Clinical Notes.

DENTAL FISTULA IN A DOG.

By Professor J. J. O'CONNOR.

Dublin.

Subject.—A Skye terrier.

Symptoms.—A dental fistula communicating with the upper carnarsial tooth on the left side.

Treatment.—In extracting the tooth, which was firmly fixed in its socket, the anterior fang fractured, and portion of it remained in the alveolus. As this fang seemed healthy it was thought that the fistula might now heal, but it refused to do so, and consequently I cut through the mucous membrane at the junction of the gum and cheek, and separated the skin and underlying tissues from the bone at the level of the alveolus, which I then trephined, and removed from it the remaining portion of the dental fang. After the treatment the fistula rapidly healed.

VENTRAL HERNIA IN A BITCH.

By Professor J. J. O'CONNOR.

Dublin.

Subject.—A valuable harrier bitch.

History.—The bitch was found in the kennel with an abdominal swelling, apparently caused by being attacked by the other dogs.

Symptoms.—Those of a large hernia in the middle line a little in front of the pubis.

Treatment.—I opened the hernial sac and found that it was not lined by peritoneum, and the omentum was attached to it throughout. The edges of the hernial ring, which admitted two fingers, were ½ in. in depth or thickness, and very hard. Hæmorrhage was more profuse than usual in this region. I separated the adherent omentum from the sac, removed some of it, and sutured the hernial ring with silk. The insertion of the sutures was very difficult with a slightly-curved needle, owing to the thickness and hardness of the lips of the hernial ring. I shortened the skin of the sac and sutured the skin wound. A good deal of blood oozed through the cutaneous sutures, preventing sealing with collodion and iodoform. Healing by second intention occurred and was very protracted, as some of the buried sutures which required removal were very deeply situated and difficult to find, but

eventually the wound closed nicely, and the bitch became quite normal in appearance. I also had a couple of cases of inguinal hernia recently in which the omentum was extensively adherent to the sac.

SARCOMA OF THE INTESTINE OF A DOG.

By Professor J. J. O'CONNOR.

Dublin.

Subject.—An aged Scotch terrier dog.

History.—Three or four weeks ago the dog passed blood copiously from the rectum, it being reckoned that a teacupful was passed at a time. Two or three fragments of bone were also passed, and it was thought that they were the cause of the bleeding, but it continued after their expulsion, the fæces, which were soft, being always mixed with blood.

Symptoms.—The dog was very thin but in fairly good spirits, and feeding well. The visible mucous membranes were extremely pale. There was no evidence of abdominal pain. On manipulation of the abdominal wall a fairly large, somewhat doughy mass could be felt but its nature could not be definitely ascertained, and there was no pain evinced on its being compressed. It could not be an obstruction in the bowel as there was no evidence as such. The condition was diagnosed as either ulceration or malignant disease of the bowel.

Treatment.—Treatment for ulceration of the bowel was tried for a few days, but as the patient became rapidly worse, getting very weak and emaciated, he was destroyed with chloroform. *Post-mortem* examination revealed a thickening of the entire circumference of the bowel for a distance of about 4 in., the wall of the bowel being about ½ in. in thickness and fibrous in appearance and consistency. Professor Mettam made a microscopic examination of the lesion and found that it was a sarcoma. There were other small thickenings in the course of the bowel, and the lining of the organ in the region of the large tumour was hæmorrhagic.

Abstracts.

ERADICATION OF TICKS BY THE STARVATION METHOD.

By H. E. LAWS, B.Sc., F.I.C., and B. MANNING.

Gonubie Park, East London, South Africa.

The part played by the different species of ticks in the transmission of various diseases amongst stock and domestic animals is unfortunately too well known to all owners of stock running on the coast veld of the Cape Colony to be cited here.

If the presence of the tick is essential to the propagation of the disease, then tick eradication will eventually result in its extermination.

We know of no case where any species of tick, and hence the disease conveyed by it, has been completely exterminated, but the ravages of many have been reduced, and the disease controlled in a number of instances. Our work here during the last few years has proved beyond doubt that it is possible for any persevering farmer to keep the ticks in a state of suppression to such an extent that losses from the diseases conveyed by them are reduced to a negligible quantity. This is emphasized particularly by the fact that, in the early stages of our experimental work, losses amongst sheep and calves due to heartwater were frequent and numerous.

Cases of heartwater amongst our calves are now practically non-existent, and during the later stages of our sheep grazing no deaths whatever occurred from this disease.

The methods hitherto adopted for eradication of ticks are:—

(1) Periodic dipping of the hosts.

(2) Grass burning.

(3) Enclosing of defined areas for a sufficient length of time to ensure all ticks dying off through the absence of hosts.

We will deal with these three methods categorically.

(1) *Dipping of Hosts.*—Dipping is undoubtedly the best method for eradicating ticks, provided an efficient dip be used. We have proved by a series of experiments that the most efficient and economical dips contain arsenic in some form, although a number of other substances are almost as effective in destroying ticks, and some of these can be used with advantage in conjunction with arsenic.

Dipping must be periodic; the intervals between each dipping varying with the species of ticks which are to be eradicated.

Cattle dipping has been in progress here for the last five years, but it is only for the past two years or more that stringent methods have been adopted. The interval between each dipping is fourteen days, and the eradication is carried out by a system of rotation. Each camp is overstocked in turn with cattle, which are dipped fortnightly, until the pasturage is so low that the animals cannot maintain their condition; then they are moved to another paddock and the work continued there until the same stage is reached. The cattle are then either moved into a third paddock or returned to the first. This overstocking reduces the natural covering for the ticks, and the cleaning of each paddock is therefore done in a minimum amount of time.

By this means we have practically now not only exterminated every species of tick, but have also improved the condition of the veld, an achievement which is impossible when burning or starvation is adopted.

(2) *Burning of Grass.*—This has been practised by a number of farmers, and doubtless burning does destroy a certain number of ticks if it is done when the ticks are on the top of the grass.

The best time to burn for the destruction of ticks is in March and April; but even then only a small proportion of the ticks are destroyed, and if no other means are adopted, total eradication must be regarded as out of the question. Burning is also to be deprecated on account of the impoverishment of the pasturage which must of necessity result.

(3) *Starvation.*—Or enclosing of defined areas for a sufficient length of time to ensure all ticks dying off through the absence of hosts. If a tick is confined in an enclosed space for a sufficient length of time it will eventually die of starvation. Experiments have been carried out by Mr. Lounsbury and others to ascertain the period which the different species of ticks will survive without access to hosts, and a few experiments in this connection have been done in the laboratory here, with the following results:—

On November 4, 1908, fully engorged female bonts, browns, blues and reds, were placed in separate tubes in the incubator. In due course the laying was completed and the larvæ hatched out.

On June 1, 1909, the larvæ of all species had started to die, the browns showing less life than the others.

On December 16, 1909, all the browns were dead, but some of the bonts, blues and reds were still alive.

On February 1, 1910, (fifteen months after), a few bonts and reds were still alive, but all the blues were dead.

By the end of March, 1910, all the bonts and reds were dead.

From these results one would conclude that if an area be enclosed so that no possible host has access to it the ticks in that area would be exterminated well within the space of two years. Theoretically this would be the easiest way of eradicating ticks, but in practice many difficulties arise which complicate matters. Not the least important of these is due to the fact that it is almost impossible to enclose a paddock of sufficient dimensions for the requirements of this experiment so that no ground game nor birds of any kind can have access to it. These will not only act as hosts for the ticks (in the paddock) which desire to feed, but will also be the means of bringing in ticks from beyond the enclosed area.

The idea of enclosing a small space free from bushes, about one or two acres in extent, by means of double fences situated about 10 ft. apart, the outside being supplied with netting to keep out all game, was first of all considered, but was discarded as being impracticable. If this course was adopted, although the grass could be burnt at the commencement in order to drive out all game, we would still have to contend with birds. Our experiment, strictly speaking, does not give us any information regarding the period ticks will survive without feeding on a host: it was merely intended to ascertain the effect of keeping pasturage free from stock for considerable periods, and so compare its influence on the extermination of ticks with overstocking

of similar pasturage, and dipping at fortnightly intervals. We desired to make a practical test which could be undertaken by any farmer who is willing to allow parts of his veld to lie idle for a time.

The camp selected at Gonubie Park for the purpose is enclosed with a single 4 ft. 6 in. six-strand wire fence, one barbed and five plain, about 160 acres in extent.

Down the centre of the camp runs a ravine, the banks of which are covered with brushwood and trees, which spread, in one part, into a bush about one hundred yards wide. The lower portion of the camp is flat pasture land with coarse ferns distributed amongst the grasses. In the upper portion the one side of the camp is covered with scattered mimosa trees, notoriously excellent covering for such ticks as bonts, which require shade. In summer the grass is often 3 ft. high in this portion. On the other side of the ravine are clumps of bushes which afford splendid cover for ticks. The grass was only of a moderate height between these bushes, being of the variety commonly called "rooi grass."

Owing to the nature of the area enclosed, game, especially hares and duiker, is fairly plentiful; and although several determined efforts were made to drive them out during the time the camp has been enclosed, yet the retired position of the camp and the absence of foreign life within its precints were sufficient inducement for the buck and hares to return to it.

Several duiker have been shot at different times in the camp, and on examination we have found them well infested with larval and nymphal reds, browns, and buck ticks (*Ixodes pilosus*).

On May 1, 1908, the camp was enclosed, and at the end of twelve and eighteen months, respectively, clean cattle were put into it for three days, when, on examination, they were found to be well infested with ticks.

On February 2, 1910, twenty-one months after the camp had been closed, its degree of infestation was again tested. Three beasts were cleaned of ticks by hand, and then sprayed with a mixture of paraffin and water to kill any larval or nymphal ticks which might be concealed by the hair. They were then driven into the camp and allowed to remain there for three days, *i.e.*, until February 5, 1910. On examination, after being taken out, the following ticks were found:—

Two red ticks (*R. evertsi*).
Forty-four Cape brown (*R. capensis*).
Two brown (*R. appendiculatus*).
Three blackpitted brown (*R. simus*).
Three male and one female bont (*Amblyomma hebraeum*).

The above gives a total of fifty-five adult ticks. The number of cattle was so small, and the area so large, that the number of ticks found does not convey any idea as to the degree of infestation of the camp. After this examination of the camp, and on account of the results obtained, we proposed to burn the grass before making our next test. We were approached by Mr. Lounsbury and Mr. Borthwick, who asked us to allow the camp to remain unburnt. Finally it was decided to burn one half and leave the other; then erect a temporary fence dividing the burnt from the unburnt portion.

The burning of the camp was done thoroughly on March 22, 1910. That portion which contains the most thorn bushes was burnt, and

the more open veld left. The erection of the fence was commenced immediately afterwards within the burnt portion, leaving a margin of about 30 ft. wide of burnt patch running right down the unburnt side of the fence, to prevent any ticks from the unburnt crawling through to the burnt section.

THE FOURTH EXAMINATION OF THE CAMP.

The Burnt Section.—On May 10, 1910, ten beasts, which had been dipped on May 7 in the Gonubie Bath, were cleaned of ticks by hand, and immediately driven into the burnt portion of the Starvation Camp. They were taken out seventy-two hours after being put in, *i.e.*, on May 13, and immediately examined, with the following results:—

On the ten beasts only four adult ticks were found. Owing to such a scarcity of ticks on these ten beasts it was decided to repeat the experiment. The same ten beasts were driven back into the burnt portion of the camp on May 13. On May 17, *i.e.*, ninety-six hours later, they were taken out and immediately examined, with the following results:—

On the ten beasts thirty-two adult ticks were found. In addition, one beast was found to be infested in the bottom of its ears with larval and nymphal reds.

On the conclusion of this examination it was decided to compare the state of the burnt section of the Starvation Camp with some of the farm camps which are being cleaned in rotation by overstocking and fortnightly dipping, and have not been burnt for six years at least.

On May 17 these cattle, after thorough cleaning by hand, were put into the largest camp on the farm, at the Gonubie Mouth, and allowed to run there until May 20, when they were taken out for examination.

On the ten beasts only twenty adult ticks were found. They were also free from larvæ and nymphs.

The Unburnt Section.—At 5.30 p.m. on May 10, ten beasts were cleaned of ticks and driven into the unburnt portion of the Starvation Camp, and remained there until 9 a.m. on May 14, when they were subjected to examination. On the ten beasts twenty-one adult ticks and one nymph were found. In order to make a true comparison between the degree of infestation of the burnt and unburnt section of the camp, these ten beasts were put back into the unburnt portion of the camp and allowed to remain there until May 17, when they were brought out and examined the second time. In each instance the cattle were prevented from grazing on the burnt margin near the temporary fence. On the ten beasts thirty-seven adult ticks were found. In addition, one beast was found with larval reds in its ears.

These ten beasts were, after being cleaned, put into the "Sea Camp," another of the camps near the foreshore, on May 17, where they remained until May 20, when they were taken out and examined. On the ten beasts only sixteen adult ticks were found.

In the first part of this experiment the cattle were in the unburnt portion a few hours longer than those in the burnt portion, but even allowing for this, there are fewer ticks in the burnt section than in the unburnt. This bears out the theory that grass burning at the right season destroys a number of ticks.

Conclusions.

From the above it is obvious that the method of starvation reduces considerably the number of ticks within the enclosed area, and that, if starvation be combined with the burning of the grass, the numbers are still further reduced; but so long as game have access to the enclosed area, total eradication is out of the question, the large majority of the ticks remaining there being species which are often found on all kinds of game, particularly bush buck and duiker.

The tremendous difference in the number of ticks found at the first and second tests of both portions of the Starvation Camp is probably due to the fact that the cattle had recently been dipped at the time the first test was made, which gives the cattle a certain protection for a short time. The results of the second tests can be taken as normal; and these we must take as our standard when preparing the degree of infestation of this Starvation Paddock with the other grazing paddocks on the farm. When this standard is taken we find that both the grazing paddocks are cleaner than the burnt portion of the Starvation Paddock, and infinitely cleaner than the unburnt portion.

Thus we have proved beyond doubt that periodic dipping in an efficient dip at intervals of not more than fourteen days is a superior process for the extermination of ticks of all kinds than starvation, and at the same time the former method has the advantage over the latter in that it can be carried on in conjunction with the ordinary farm work. Incidentally the nature of the pasturage is considerably improved by the former process, whereas the latter tends to impoverish it.

Our experimental work here was undertaken primarily with the object of eradicating bont ticks—hence the fortnightly interval was adopted for each dipping.

Seeing that we found only two bonts in the two camps, covering an area of 1,000 acres, or more than one-third the extent of the farm, the results may be regarded as highly satisfactory. But there are still as many browns and reds in these camps as in the burnt portion of the Starvation Camp. This is on account of the fact that these species stay on the host for such a short time that the majority of them escape the dippings. Fortunately they require only a weak dip to destroy them, and this can be used at more frequent intervals than that which is required to kill female bonts.

It is quite possible that in due course, if our work here is continued on the same lines as in the past, we shall be as successful in exterminating brown ticks as we have been with bonts; but, in view of the fact that East Coast fever is approaching the Colony, this process would necessarily be considered far too lengthy with such a long interval between dippings on those farms where ticks have been allowed to increase, and no means have hitherto been devised for controlling them.

To meet the requirements of such cases, dipping (or spraying) every seven or five days would be necessary. This process would incidentally destroy all other species of ticks.

(*Agricultural Journal, Cape of Good Hope.*)

TECHNIQUE FOR OBTAINING OPSONIC INDICES.

By Major J. B. ANDERSON.

Royal Army Medical Corps.

There are plenty of knowledgeable persons about who are ready to explain what opsonic indices are and how to take them, and I am aware much has been written in the different periodicals on the subject, but the difficulty is where to find the matter. My object in writing these few lines is to supply this want, as when at home I searched the booksellers for literature on the technique and could find none. By chance I came across Dr. Houghton's "Review of Opsonins," and when taking a course at St. Mary's Hospital was given some excellent leaflets on the subject.

For those not instructed in the rudiments or principles of the subject, it might be well to ask the question, What is an "Opsonic Index"? The answer resolves itself into saying that a film or smear is made on an ordinary slide from a mixture (that has been incubated a little) of (1) washed blood corpuscles; (2) bacterial emulsion; (3) patient's serum. This film is appropriately stained, and when examined under the $\frac{1}{12}$ oil immersion it is seen that phagocytosis has taken place. The microbic contents of, say, 100 polymorphonuclear neutrophiles are enumerated, and the number divided by 100 will therefore give the average number of bacteria in each white cell; this is called the phagocytic count or content, and should not be less than about three per cell, except for tubercle, which should be about two per cell. A phagocytic count is made in a similar way with (1) washed blood corpuscles; (2) bacterial emulsion; (3) normal or pooled serum; and this latter divided into the former gives the "opsonic index" of the patient against the particular bacterium used in the emulsion.

An example might make it clearer.

(1) From film made with patient's serum it is found that 100 polymorphonuclear cells contain 350 bacilli or cocci.

(2) From film made with control, normal, or pooled serum, 100 polymorphonuclears contain 280 bacilli or cocci; then 3·50 will be the patient's phagocytic count, and 2·80 the control count. Therefore, $3{\cdot}50 \div 2{\cdot}80 = 1{\cdot}25$, and this is the "Opsonic Index" of the patient against the particular bacillus or coccus used in the emulsion, 1·0 being approximately the normal. The technique employed may appear at first simple, but it is only by constant practice that anything approaching reliable results can be obtained. The pitfalls are many, so it is as well at first not to be too dogmatic about conclusions until all technicalities are overcome and one's results are more or less consistent.

It will be seen that for the estimation of opsonic indices three essentials are necessary, viz.:—

(1) Sera, viz., (*a*) serum of patient whose opsonic index is required; (*b*) serum of normal person for control.[1]

(2) Washed corpuscles.

(3) Emulsion of bacteria.

[1] As one normal serum alone does not give a fair estimation of a normal index, it is usual to take two or three normal sera and mix them. This is called a "pooled serum." The index of each may also be taken separately, and the average of these considered as the normal.

These we will now proceed to prepare *seriatim*, and I place sera first, as during the preparation of the other two time is given for the serum to separate out.

(1) *Sera.*—Both the patient's and normal sera are best collected in the usual manner in glass capsules, which must not be over heated when sealing in the flame. The blood should also be fresh, as after about five days the fluids have lost about half their opsonising powers. By placing the capsules and their contents into an opsonizer, a name given to a convenient and simple form of incubator, at 37° C., for from a quarter to half an hour, the sera will separate from the clot more quickly.

After the clot is formed, and not before, the capsules may be placed in a centrifuge to accelerate the separation if necessary. If the clot has not formed, plasma instead of serum will separate out, and this, when mixed with the washed corpuscles and emulsion, will produce clotting, thus nullifying results. There is no reason why serum alone should not be sent for examination, put up in a sealed capillary tube, provided, of course, it is not too old when received.

(2) *Washed Corpuscles.*—Take a clean glass tube about 2 in. long and $\frac{1}{4}$ in. to $\frac{1}{5}$ in. in diameter, one end of which is closed. Fill two-thirds of this tube with 1·5 per cent. citrate of soda solution, and the remaining one-third with ordinary blood from the finger.

Before and after centrifuging place the tube with its contents between the forefinger and thumb, and invert it three or four times to mix the citrate solution and blood. It must not be shaken. Centrifuge till the corpuscles just settle. Too much centrifuging is apt to compress the red cells, and cause the leucocytes to adhere to each other. With a pipette and teat, remove as much as possible of the citrate solution, adding in its place 1·86 per cent. sodium chloride solution. Wash by inverting (as was done with the citrate of soda solution) for a minute or so, then pipette off the salt solution. Mix the remaining blood cells intimately by means of a pipette and teat, and a homogeneous mixture of washed corpuscles will be obtained, which will keep for twenty-four hours.

(3) *Emulsion of Bacteria.*—This is the most difficult part of the technique. It is essential that the living growth from which the culture, and afterwards the emulsion, is made be a pure one. The age of coliform and Gram-negative cocci should be from about four to ten hours, as if older, they are unlikely to take the stain. Staphylococcal growths on agar may be twelve to twenty-four hours old. Streptococcal growths on agar about the same age, but three or four tubes should be prepared, as the growth is usually scanty. Gonococcal[1] growths usually should be four to eight hours, but may be sometimes ten to twelve hours. Emulsions of tubercle bacilli, as will presently be seen, are not usually made directly from a living culture, as the process of obtaining a growth is difficult and tedious. They can be conveniently and easily obtained from dry tuberculin powder.

Having obtained a satisfactory growth, take a loopful and emulsify it with two or three drops of 0·85 per cent. NaCl solution in a clean watch-glass. Avoid pouring salt solution on to the growth in the tube. The emulsifying is more satisfactorily carried out with a mixing pipette, attached to which is a rubber teat.

[1] Best grown on agar, the surface of which is spread with sterilized serum.

By holding the pipette perpendicularly to the watch-glass the emulsion can be alternately sucked up and forced out for five or more minutes, which action breaks up any clumps. Streptococcal growths usually require more emulsifying than staphylococcal, in order to get rid of the chains. If necessary, more salt solution may be added, but the important point is to get an emulsion of the right consistency, which is a matter of practice, and achieved by educating the eye on looking through a glass stump[1] containing some of the material, and seeing how translucent it is and whether of the right milky opalescence. Invariably it has to be centrifuged, and this is best done whilst in the stump, to precipitate the clumps. Afterwards the supernatant fluid is pipetted off and placed in a similar stump, which, again, must be scrutinised with the naked eye. If it still appears too thick, more centrifuging can be done, or more salt solution added, or both. Bacillary emulsions always appear more milky and turbid than coccal ones; in the latter the opacity is but slight. Having obtained what may be considered a good emulsion, it must now be put to the test to see whether it is so or not. In order to do this equal quantities of washed corpuscles, emulsion, and serum, in the order named, are taken into a throttled pipette, separated from one another by an air space. The teat is compressed, and the contents are driven on to a clean slide. These are now thoroughly mixed with a mixing pipette, into which the mixture is finally drawn. The pipette is then sealed off and placed in the incubator or opsonizer for about fifteen minutes. The contents are then blown out on to a slide, cleaned by rubbing it gently for a few seconds with very fine emery paper, then cleaning with a duster (this method is as good as using alcohol and ether). Films are now made and appropriately stained, and examined with the $\frac{1}{12}$th. If the emulsion is a good one, *i.e.*, not too thick or too thin, each phagocyte ought to contain two or three bacteria.

An emulsion of tubercle bacilli is prepared somewhat differently, and is made from either a fresh culture or from dead tubercle germs, the latter being the more convenient method, as the germs are easily procurable in the form of a powder. Take a little of this powder—about half as much as can be got on to a threepenny piece—and put it into an agate mortar, and with a pestle thoroughly grind down: 1·5 per cent. salt solution is now added drop by drop to form a paste. This percentage is used, as with a smaller amount of salt the solution favours phagycytosis, producing what is known as spontaneous phagocytosis. It might be here mentioned that the same percentage is used for making emulsions of Gram-negative cocci, such as the gonococcus and *Micrococcus neoformans*—a coccus found at the edge of cancerous growths. The grinding is still continued, and a little more of the diluent is added till the paste becomes an emulsion. This part of the process takes from eight to ten minutes. Now place the emulsion in a special bulbed tube, when it can be further mixed for two or three minutes with a mixing pipette. The contents are then placed in a clean test-tube, and made up to about 4 c.c. with the salt solution. The test-tube is then closed in a flame, at the same time drawing out a neck. It may now be shaken in a machine called a shaker, or else

[1] A glass stump is best made by breaking a throttled pipette at its neck, then sealing off.

by hand, for about half an hour or more. Let it settle for a minute or two. Now break the neck, and take about 2 c.c. of the clean fluid and place it in a glass stump; centrifuge three or four minutes to precipitate any clumps, and pipette off the supernatant fluid, which is put into another glass stump. Its opalescence is now tested with the naked eye. If it appears too thick, it may again be centrifuged, or else some 1·5 per cent. salt solution may be added, provided there are no clumps. Presuming now an emulsion has been obtained of the right consistency, a little can be put up with washed corpuscles and serum as was done previously: then, if found necessary, it may again be centrifuged or diluted, or both.

Having described in detail the preparation of the three essentials, it now becomes necessary to describe how these are put up, then how the smear is made, stained, and, finally, to show how the counting is done.

(1) *How to put up the Test.*—A pipette, to which is attached a rubber teat, is taken, and into it are drawn equal quantities of the washed blood corpuscles, emulsion, and serum, each occupying about an inch of the tubing, and being separated from each other by an air space. These are then put out on to a slide by compressing the teat, and then intimately mixed by alternately drawing up and expelling the mixture three or four times. When finally it is drawn up for the last time, air spaces must be carefully avoided as they interfere with phagocytosis. The end is then sealed off in a flame, and the pipette placed in the opsonizer for fifteen minutes.

(2) *How to make the Smear.*—Having removed the pipette from the opsonizer, nip the end of it off, and put a small drop out on to a clean slide and make a smear. The smear is best made with a special spreader, which greatly simplifies the counting. Its spreading edge ought to be sharp and very slightly concave. It can be made thus: Take an ordinary glass slide and nick the middle of each of its long edges with a file. Take the slide between the forefinger and the thumb of each hand, and bend it sufficiently till it snaps across. After a few attempts a half of one of the slides will be found to possess a satisfactory shape and slightly concave edge. Nick off the corners of this edge with the assistance of a file, so that the smear when made will not occupy the whole breadth of the slide.

The smear should be equal and regular, and contain nearly all the leucocytes at its extremity. The idea of the concavity is to pass over the red cells, yet not to pass over the white cells, which it draws to the end of the smear.

(3) *How to Stain the Specimen.*—Films may be stained with Leishman in the ordinary way, or with carbol-thionin (¼ per cent. thionin, 1 per cent. carbolic acid) for quarter of an hour. Tubercle films should be fixed with formalin and not with perchloride, as the white cells get broken up when stained with the carbol-fuchsin. Place the film over the vapour of formalin for five seconds, then pour on boiling carbol-fuchsin and leave for ten minutes. Wash in tap-water, and then place in 2 per cent. H_2SO_4 till the colour just rises, which will be in a few seconds, wash, then add 4 per cent. acetic acid for a moment, washing it off almost immediately. The acetic acid washes out the red cells, which would otherwise overstain with methylene blue, which is now added as a counter-stain, for a minute or so, when it is washed

off and the slide dried. This methylene blue has a strength of ½ per cent., to which ½ per cent. sodium carbonate is added.

(4) *How to Count.*—This having been touched upon at the beginning of the subject there remains but little to add. Should the number of bacteria be counted in, say, only fifty polynuclears, then the result must naturally be multiplied by 2 before dividing by 100 to get the phagocytic count, which is necessary, as I have already shown that the opsonic index is the phagocytic count of the patient divided by the phagocytic count of the pooled serum. I think the best method of counting is to enumerate the number of bacteria in five leucocytes at a time. An example will render this clear.

Number of bacteria in 100 leucocytes in series of five at a time. Patient:—

16	32	30	11	20	25	2	23	17	18	=	194
5	33	12	44	19	30	14	21	12	19	=	209
								Total	...		403

Number of bacteria in 100 leucocytes in series of five at a time. Pooled serum:—

25	19	20	12	8	13	11	18	22	8	=	156
7	27	13	23	30	12	11	12	22	5	=	162
								Total	..		318

Therefore 403 ÷ 100 = 4·03 phagocytic count of patient; and
318 ÷ 100 = 3·18 ,, ,, pooled sera.

Therefore $\frac{4 \cdot 03}{3 \cdot 18} = 1 \cdot 26$ = opsonic index.

(*Journal of the Royal Army Medical Corps.*)

Reviews.

Manual of Tropical Medicine. By A. Castellani, M.D., Member of the Royal Society's Commission on Sleeping Sickness in Uganda, and A. J. Chalmers, M.D., F.R.C.S., D.P.H., Colombo. Demy 8vo., pp. xxx. + 1242, with 373 illustrations and 14 coloured plates. Published by Messrs. Baillière, Tindall and Cox, London. Price 21s. net.

Drs. Castellani and Chalmers are to be congratulated in having produced in the manual a work of great excellence, and one which is really indispensable to all practitioners and students of Tropical medicine. The authors have had almost unique opportunities of becoming directly and intimately acquainted with the subject matter of the volume, which, of course, renders it much more valuable than it could otherwise be. The results of the latest investigations are all included, and the whole volume is well up to date. The work consists of three parts. Part I. occupies 84 pages and is introductory, including a history of tropical medicine, tropical climatology, and an account of the incidence of disease in the Tropics, referring especially to the occurrence of the various diseases in

different parts of the Tropics and the different races attacked. Part II. occupies about 500 pages and deals with the causation of disease in the Tropics, both physical, chemical, and biological. The morphology of the various biological causes is excellently described; in fact this section is probably more complete than any standard work on Tropical parasitology.

Part III. deals with the diseases of the Tropics, and completes the work. Each disease is described systematically under the headings Synonyms, Definitions, History, Climatology, Etiology, Pathology, Symptomatology, Diagnosis, Prognosis, Treatment, and Prophylaxis. In some cases it has been considered necessary, and we think rightly so, to repeat in some degree the description of parasites given in Part II. This procedure renders the context more readily understood.

The numerous illustrations, which are very clear and well produced, will be found of the greatest service to students.

The work is one which should be in the hands of all practitioners and student of tropical medicine and all investigators of tropical diseases.

The manual, which is one of the University series, is well up to the usual excellence of production of the publishers.

The Encyclopædia of Sport. Parts III., IV., and V. Profusely illustrated with drawings, photographs, and coloured plates. Complete in about thirty parts, issued fortnightly. Published by Mr. W. Heinemann, London. 1s. net.

We have already appreciatively referred to Parts I. and II. of this work, and can now speak in similar terms of Parts III., IV., and V. Part III. concludes the excellent article on automobiles, and also deals with badger-hunting, badminton, baseball, and bear-shooting. It commences an excellent article on big game, which is continued in Part IV., and occupies about fifty most excellently illustrated pages. Billiards is the next subject taken in hand, and so much is to be said on the popular game and its variations—English and French billiards, snooker, pool, pyramids—that over forty pages are required, the subject being carried over to Part V. This part contains well-written articles on bird's-nesting, bison and buffalo hunting, and wild boar shooting, bowls, boxing, and bull-fighting. One point we regret to notice in the later parts is a falling off in the number of coloured plates.

Translations.

A CASE OF CEREBRAL TUMOUR.

By M. A. PICARD.

Veterinary Surgeon to the 21st Dragoons (France).

A MARE of the third squadron was brought to the infirmary, and presented very pronounced cerebral trouble. She bored at the wall, had very violent crises, during which she fell about on the objects surrounding her. At the end of twenty-four hours she died; a diagnosis of meningo-encephalitis had been given.

The lesions found at the autopsy were very interesting, it having been made chiefly on the nerve centres. The dura mater was congested, and showed in places some thickenings like milk-white plates; the pia mater and all the encephalic portion were congested, especially at the level of the inferior face of the bulb where the dilated vessels formed a dark red arborization. The left hemisphere, on simple inspection, seemed more congested than the right. The whole of the encephalus was œdematous, and of rather abnormal volume. A horizontal section of the two hemispheres passing through the upper face of the corpus callosum was made. On arriving at the right lateral ventricle a considerable quantity of citron yellow liquid was discharged. The left lateral ventricle was occupied by a yellowish, fibrinous mass, and at first sight very vascular on its surface. This mass was 6 c.m. long, and extended into all the frontal cornu from the ventricular crossway; this mass, more voluminous than the ventricle, was folded on its walls, and compressed the oval centre, which was slightly congested. The anterior extremity of the frontal cornu extended to within 1 c.m. of the frontal extremity of the left hemisphere, and was on a more anterior plane than that of the right ventricle.

This tumour was carefully dissected out and enucleated. We noticed that it was adherent by its posterior part to the upper choroidean tissue, which seemed to form a pedicle; the choroid plexuses were prolonged on the upper edge of the tumour up to its anterior part. This yellowish tumour resisted the impression of the finger and allowed serum to transude in large quantity; cut longitudinally a resistant and reddish tissue was encountered. Preserved in a solution of formalin, and examined after hardening, the neoplastic tissue had become white, and on section we encountered a whitish tissue studded with little black islets.

Histological examination by Professor Curtiss, of Lille, revealed a hard, round-celled sarcoma, with large spaces of mucous tissue dominating all the preparation, and coloured a uniform red with picro-carmine. Evidently we had to deal with a myxo-sarcoma originating in the dura mater.

(*Revue Générale de Médecine Vétérinaire.*)

HÆMOPNEUMOTHORAX IN THE DOG DUE TO THE PENETRATION OF AN EAR OF CORN INTO THE LUNGS.

By Professor J. POENARU.

Hæmopneumothorax represents a discharge of sanguinolent liquid and air into the thoracic cavity. This affection, which happens very rarely in our domestic animals as a complication of tuberculosis, gangrene, cancer, pulmono-pleural hæmatoma, is still rarer when it is due to a foreign body such as an ear of wheat, which, penetrating from the stomach into the thoracic cavity, causes lesions in the pleural serosa and the lung, and sets up traumatic hæmopneumothorax.

The subject of our observation is a French setter, strong and muscular, with which his master went out sporting in the month of August, 1909. The following day he observed that his dog was dull, that it ate very little, remained lying about, vomited often, and was weak, This state lasted until the month of October, when the animal commenced to cough and expectorate blood.

At the time of examination the animal presented the following symptoms: dulness; respiratory muscles atrophied; eyes sunk in the orbit; ocular and buccal mucosæ pallid; labial breathing; sanguinolent discharge; respiration dyspnœic and very superficial; a pronounced orthopnœa; intercostal spaces prominent and convex; pulse feeble and accelerated, temperature 38° C. On auscultation, bronchial râles and a particular inspiration resembling an amphoric râle; vesicular murmur diminished on account of a clear sound exaggerated by percussion in the superior parts of the thoracic cavity; in the inferior region a dull sound of metallic character. The painful cough was accompanied by an effort at vomiting, which threw off by the nose and the mouth a sanguinolent and foamy liquid—a veritable hæmoptysis.

From similar symptoms previously seen, the diagnosis of tuberculosis with pneumothorax was given. The tuberculin test gave negative results, however. The symptom of hæmoptysis was treated with injections of gelatinized serum, with five drops of adrenalin and 1 milligramme of ergotinin Tanret in subcutaneous injections. However, the illness progressed, and the animal died on October 30.

Autopsy.—Six hundred grammes of blood in the thoracic cavity and the pulmonary lobes atelectesied on their inferior borders; the diaphragmatic face of the pulmonary lobes adherent to the diaphragm; a pleuro-pulmonary diaphragmatic symphysis (dry pleurisy).

The superior edge of the right pulmonary lobe traversed from above to below and from behind to in front by an ear of wheat, causing a pulmonary rupture covered with clots of blood.

On the anterior face of the diaphragm a pimpled wound, which corresponds on its opposed face to an adherence of the stomach, in its depth the wound is completely cicatrized. Around the pulmonary wound one observes a hæmorrhagic congestion, and in the bronchi and trachea frothy blood.

As a *résumé*, the evolution of the malady must have been the following: The dog in his track across the field swallowed a whole

ear of wheat; by movement and efforts provoked by vomiting this ear became implanted on the wall of the stomach and penetrated it and the diaphragm, causing a fistulous wound, which produced first an adherence between the stomach and diaphragm, followed by dry diaphragmatic pleurisy with pleuro-pulmonary symphysis.

The pulmonary lobes being fixed by a tissue of new formation to the diaphragm, their posterior face has become more bound down, and in this way the ear of wheat has passed through the pulmonary lobe from below to above, producing a wound large enough to cause hæmothorax at the same time as pneumothorax.

(*Archiva Veterinaria.*)

AN OBSTETRICAL OBSERVATION.

BY MARTIN.

A cow, about eight months pregnant, had been straining for three days, and ejecting a brown liquid of bad odour. The general state was good. Manual exploration showed a posterior presentation, and that the envelopes were putrefied. Parturition was effected without much difficulty, a normal calf being produced in an apparent state of death; after ten minutes' artificial respiration it was resuscitated. Afterwards its development was quite normal. The mother died some hours after calving.

The autopsy showed metritis and septic peritonitis (30 litres of brown chocolate exudate in the peritoneum).

This observation shows that a calf can continue to live in a violently inflamed womb surrounded by putrefied envelopes.

(*Münchener Tierärztliche Wochenschrift.*)

A CASE OF ŒSOPHAGISMUS.

BY BERTON.

A MARE, before being operated on, received 20 grm. of sulphonal in 100 grm. of dry bran. During the whole operation she struggled. After getting up she was led into the box, and took some mouthfuls of hay from the rack. But suddenly mastication was arrested, the physiognomy became anxious, the legs stiffened, the head was extended on the neck and suddenly stretched out and shaken with spasms which extended over the whole body. These spasms were accompanied by audible groans, and followed after a few seconds by a bilateral nasal discharge of copious viscous material, greyish-white, of salivary appearance; and this in its turn was followed by an inodorous, liquid, greenish vomit containing particles of chewed hay.

During three-quarters of an hour these phenomena were renewed ten times, with progressively decreasing intensity. The material thrown up became less and less abundant, and more and more clear, until finally it was purely salivary. Some hours afterwards only prostration remained; there was no other bad sign. It was only three days afterwards that a myositis of the cervical region became evident.

(*Revue Vétérinaire Militaire.*)

PYOMETRA OF THE BITCH.

By KARL KELLER.

INFECTION results *post partum* after an abortion, or at the time of œstrum, in fact as long as the orific. extern. is open to a certain degree. Very seldom infections occur in animals which have not been lined or borne young. For pyometra to occur there must be endometritis and a collection of secretion in the uterus. The formation of the secretion occurs through injury to the internal muscular tissue of the uterus which becomes inactive, and unable to contract and open the mouth of the womb. The cause of the affection is a streptococcus, colourable by Gram; besides one finds in the pus of pyometra a bacillus with specific morphological peculiarities.

On section one finds the horns of the uterus thickened to the size of a child's arm, and the wall of the uterus 1 to 5 mm. thick. Often the widenings of the uterine horns are ampulla like. The purulent material is brown-red, brown-violet, or occasionally hæmorrhagic or yellowish-green, of thin, slimy to doughy consistency. Many a time the uterus contains stinking gases. Microscopically one finds the superficial epithelium club-shaped or inflated, the glands widened, soaked with slime or pus, the muscle bundles disintegrated by infiltrations and the filaments atrophied.

Clinical symptoms are vaginal discharge, increase of the belly circumference, slight intermittent fever, emaciation, forward vaulting of the belly, inertness, stiff gait, failure of appetite, thirst, polyuria, and as a complication, purulent cystitis and albuminuria.

Diagnosis is made from the vaginal discharge and by local examination, the absence of ichorous tumours may be determined. By palpation one can make out the fluctuating mass.

Differential diagnosis comprises the making out of pregnancy and ascites. Prognosis bad, if not treated early.

Therapy.—Total extirpation alone cures old, weak animals; those with subnormal temperature, heart deficiency, and cachectic appearances are inoperable.

(*Zeitschrift für Tiermedizin.*)

ON THE TREATMENT OF STOMACHAL INDIGESTION OF THE HORSE BY MAREK'S METHOD.

By NIEDER.

PROFESSOR MAREK, in cases of alimentary surfeit or gaseous dilatation, systematically practices sounding of the stomach, with the view of provoking forced regurgitation and relief of the organ by evacuation of its contents. He invented a special sound, and gave precise directions for its use, which Behrens later on simplified. M. Nieder adopted the technique described by the latter. He recommended "holding the animal's head down and letting the tongue go free," and used the cuneiform gag of Bayer.

The sound introduced into the mouth, the passage of the pharyngeal isthmus into the œsophagus constitutes the most delicate part of

the operation; it always provokes a certain amount of agitation, and sometimes the anguish of suffocation. These disquieting symptoms, of short duration, are deprived of ensuing harm if the operator "has some *sang froid* and a light hand." The penetration of the sound into the trachea is recognized by the great ease with which it passes, and and its sudden arrest at the bronchial bifurcation; the column of air expired, which escapes by the extremity of the sound, confirms the error of situation. In such a case the apparatus is immediately withdrawn, and a fresh attempt made. A short initiation is sufficient to surmount all difficulties. No external sign indicates the moment of penetration into the stomach.

Marek and Behrens advise taking note of the length of the sound introduced, and consider it has reached its destination when it has passed in for about 2 metres on horses standing about 1·60 metres in height. The mandarin withdrawn after a more or less prolonged waiting, according to circumstances, there is produced, in the cases of gaseous or liquid surfeit, an evacuation of gas or discharge of a liquid like dregs of wine, with a sourish odour. In surfeit, properly so called, a very small quantity of gas only is evacuated. With the help of a funnel adapted to the free extremity of the sound, some litres of warm water are introduced into the stomach, and regurgitation takes place thirty-five or forty minutes afterwards. The operation is completed by a veritable lavage of the stomach by means of 5 or 6 litres of hot water. After rubbing down and a rectal douche, the invalid is left to himself, and the cure is complete in less than an hour. One sounding alone is generally sufficient.

Out of six reported observations five cures were obtained. The one failure should not be imputed to the method, for there was a rupture of the stomach before the sounding of the organ.

(*Revue Générale de Médecine Vétérinaire.*)

Books and Periodicals, &c., Received.

Proceedings of the Royal Society of Medicine; Journal of the Royal Army Medical Corps; Bulletins of the Bureau of Sleeping Sickness; Agricultural Journal of the Cape of Good Hope; Transvaal Agricultural Journal.

Letters and Communications, &c.

Professor O'Connor; Mr. E. Ryan; Mr. J. L. Perry; Mr. J. Varney; Board of Agriculture and Fisheries; Department for Agriculture and Technical Education for Ireland; Bureau of Animal Industry.

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THE

VETERINARY JOURNAL

OCTOBER, 1910.

Editorials.

THE EXPORTATION OF HORSES.

THE Exportation of Horses Order of 1910 (No. 2), which comes into force this month, is a step in the right direction, and should do much to prevent unnecessary suffering on the part of horses being shipped from Great Britain to the Continent of Europe. By this order all horses, asses, and mules, with certain exceptions, will have to be examined by a veterinary inspector and certified fit to be shipped. For each animal examined a fee of two shillings and sixpence must be paid before the examination takes place. The exemptions consist of valuable animals intended for breeding, racing, or exhibition, and also animals being sent to any port that is not in Europe, but in all these cases a permit from the Board will be necessary. In fact no horse, ass, or mule can be shipped without either a permit or a certificate from the veterinary inspector. The order has to be enforced by the Local Authority of the district in which the port of embarkation is situate.

This order is one which appears likely to have nothing but good results. It is not likely to interfere in any serious way with legitimate horse traffic, and it will undoubtedly put a stop to the transportation of horses in an unfit state to travel. It will also put an end to those most irritating prosecutions in which the voice of a lay inspector of the R.S.P.C.A. is so often raised in conflict with that of a competent veterinary surgeon, for while both

parties are desirous of preventing cruelty, opinions differ as to whether cruelty exist in the particular cases. The worst part of such cases is that one so often meets with magistrates who prefer to believe the word of an uneducated lay inspector to that of a highly trained veterinary expert. It seems difficult to persuade some people that a horse may be mechanically lame, and be able to stand or walk about perfectly free from any pain. In such cases it is absurd to say that cruelty is inflicted if a horse is walked about or made to stand on board ship. We all know men who are lame and who go about their business daily without any pain or other inconvenience than the mechanical interference with gait. It is strange that so many people are apparently unable to transfer the same line of reasoning to the horse, and especially so when they are assured by experts that so many cases are quite painless.

We feel sure that the new Order will do all that is necessary for the protection of horses about to be exported, and at the same time safeguard those dealers legitimately engaged in the business from unwarranted persecution by lay inspectors. On the other hand, nobody will be more glad than veterinary surgeons that a stop will now be definitely put to that gross cruelty, which not infrequently occurred hitherto by unscrupulous low-class dealers engaged in the decrepit horse traffic.—G. H. W.

THE RELATION OF UDDER DISEASES OF THE COW TO SCARLET FEVER, DIPHTHERIA, AND SORE THROATS OF THE HUMAN SUBJECT.

THE very able paper on the above subject by Professor Gofton, which we reproduce in this issue of the VETERINARY JOURNAL, makes very interesting reading. It reopens an old discussion on subject-matter which is by no means settled in the minds of many veterinary surgeons and medical men. Professor Gofton has really no new evidence to bring forward, but his paper consists of a very able summary of views expressed by various authorities, and on which his conclusions are based.

There is very little room to doubt that each of the diseases

referred to may be disseminated by milk, but we agree with Professor Gofton that that is a very long way from proving that they are diseases of the cow transmitted to human beings.

It has frequently been asserted that contagious mammitis is one of the causes of sore throat in the human subject, because a somewhat similar streptococcus can be demonstrated in each case. Direct evidence of actual transmission, or satisfactory experimental proof, are wanting also. We, ourselves, were included in a number of persons who unwittingly put the matter to something in the nature of a test. An apparently healthy milch cow was brought in to a certain institution, and her milk was freely partaken of for several days by six persons—two adults and four children. Then two others took some of the milk and noticed a somewhat extra salty taste, as the result of which an examination was made, and the cow was found to be suffering from mammitis. The milk was shown to be highly charged with streptococci. In none of the eight persons who had partaken of the milk was there the slightest ill-effect observed, either in the way of sore throat or otherwise, although six persons had been drinking that milk for several days. We fully realize that this little involuntary experiment had negative results and that it actually *proves* nothing. But it must be regarded as fairly strong evidence to support the contention that sore throat cannot be commonly caused by drinking milk from cows affected with streptococcus mammitis. With regard to Dr. Klein's experiments and his conclusions we agree with Professor Gofton, and regard them as very far from conclusive.—G. H. W.

General Articles.

THE RELATIONSHIP BETWEEN SCARLET FEVER, DIPHTHERIA, AND SORE THROAT OF MAN, AND DISEASES OF THE UDDER AND TEATS OF COWS.

By A. GOFTON, M.R.C.V.S.

Professor in the Royal Dick Veterinary College, Edinburgh.

THE question of a causal relationship between disease of the cow and scarlet fever of man formed the subject of a heated controversy in 1885 and subsequent years, but for a considerable period of time it has been in a condition of at least suspended animation. Interest in the matter, however, has been in some measure reawakened by the publication last year of a report by Drs. Hamer and Jones with reference to an extensive milk-borne outbreak of scarlet fever in London and Surrey, which they concluded was attributable to an eruptive disorder of the teats and udders of the cows producing the incriminated milk.

If the cow be really the natural subject of a disease capable of causing scarlet fever in man, the necessity for its immediate recognition in the interests of public health cannot be overestimated, but it is well known that ever since the bovine scarlatina theory was first promulgated, veterinarians have been unwavering in their opposition to it. It is the purpose of this paper to discuss the relationship which exists between scarlet fever, diphtheria, and sore throat of man, and diseases of the udder and teats of cows, and to see how far the theory of the animal origin of these diseases has been supported by facts brought to light by the many inquiries which have made during the period of some thirty years that has elapsed since it was first advanced.

It is of interest to refer for a few moments to the history of milk-borne epidemics, particularly with reference to the possibility of animal infection. It is undisputed, and has long been recognized that certain diseases of the cow are communicable to man, but the part which milk may play as a medium in the spread of contagious diseases other than those from which the cow is known to suffer does not appear to have received much attention until 1857. In that year Dr. Taylor, of Penrith, published what in all probability is the first record of a milk-borne epidemic, the disease being typhoid fever. In the light of our present knowledge the part played by the milk in this instance leaves practically no room for doubt, but at the time Dr.

Taylor's conclusions were questioned. His view, however, that milk could be infected by contact with persons affected with certain contagious diseases, slowly, but certainly, became an established fact, the last remnants of doubt being effectually dispelled by the introduction, at a later date, of compulsory notification with its resulting more regular and systematic inquiry into the origin of epidemics and the means by which they were spread.

It is not in the least surprising that in the course of a large number of investigations of milk-borne epidemics, the most searching inquiries have failed at times to trace the original source of infection, although a definite relationship may have been comparatively easily established between the epidemic and the milk supply. It was such failure which originally gave rise to the suggestion that the cow might be responsible for the infectivity of the milk when infection was traceable back to the farm on which it had been produced, but no human agency to which it could be attributed was discoverable. Thus it was that Power, in investigating the 1878 epidemic of diphtheria at Kilburn and St. John's Wood, submitted the hypothesis of a cow origin, which appears to have been based on an inability to demonstrate the actual source of infection, and not upon the co-existence of any specific disease amongst the cows. Similarly, with the North London epidemic of scarlet fever in 1882, the same official writes[1]: "In the end I found myself as on a former occasion, called upon to face the question whether or not actual cow conditions might have been competent for the results observed, and in considering the question I came to see that a hypothesis of cow causation would fit the facts that needed explanation as well as, or even better than, any other hypothesis." He found that the only new element that had been introduced into the milk business for a considerable period before the milk became infective was a cow which had been some ten days overdue in calving, and whose milk had come into ordinary use three or four days later, and almost coincidently with the commencement of the outbreak, though there is a decided vagueness as to the actual date on which the milk was first used. Some five weeks after the commencement of the epidemic, Power examined this cow, and he noted that "she had here and there lost portions of her coat, and that her buttocks and posterior udder were fouled with excremental matter and perhaps vaginal discharge as well." He proceeds: "That if scarlatina have other animal source

[1] Report to the Local Government Board. Power.

than human source, it may be that one such source is the cow that has recently calved, a cow either not at all ill (except for her parturition), or not so obviously ill as would prevent her milk being used for human consumption." These appear to be the facts on which his hypothesis of the bovine origin of the outbreak were based, and on which the proposition was first seriously advanced that scarlet fever of man might have an animal origin.

This case had an important result. It led to a series of experiments being carried out by Klein, on behalf of the Local Government Board, with the view of determining the susceptibility of the cow to infection with human scarlatina, and to the issuing of instructions to the inspectors of the Board for the making of careful investigations and observations in order to discover if confirmation of Power's hypothesis was obtainable. No confirmation was forthcoming until Power discovered the disease amongst the cows at Hendon, which he, in conjunction with Klein, concluded was scarlatina of the cow, but which, on the other hand, the Agricultural Department of the Privy Council as a result of subsequent investigations just as emphatically declared bore no etiological relationship to the human scarlatina. The Hendon case was followed by a series of milk-borne epidemics which were attributed to more or less ill-defined diseases of the cow, and, similarly, diphtheria and sore throat epidemics came to be regarded in certain circles as having not infrequently a similar origin. As already stated, it is my object to see how far the facts since brought to light lend support to the theory of the animal origin of these diseases.

It is my intention to take up the three conditions separately, dealing first with scarlet fever.

Scarlet Fever.

The cow disease at Hendon is always quoted as the typical example of the alleged bovine scarlatina, and I purpose giving a description of it in order to see how far it supports the view of the occurrence of a specific disease in cows differing from other previously recognized bovine diseases. According to Klein, it presented the following clinical features: It was essentially contagious and easily conveyed from one cow to another, especially by the hands of the milkers. It was characterized by a vesico-pustular eruption on the udders and teats, commencing with red raised papules, and much injection of the skin. The pustules became covered with brown crusts, which if removed exposed a bleeding sore, but if left untouched

thickened and ultimately became loose, falling off in from ten to fifteen days, and leaving a contracting healing sore. A slightly raised reddish scar marked the site of the lesion when completely healed. Ulceration, scabs, scurfiness, and loss of hair in patches on different parts of the skin accompanied the udder lesions. The cows had a slight cough and lost condition, but there was no fever and no apparent general disturbance of health.

None of these symptoms individually, nor the whole of them collectively, enable one to diagnose the condition. The description of the udder lesion is equally applicable to more than one of the well-known eruptive conditions met with in milk cows, and at the time of the "Hendon disease" members of the veterinary profession were unable to discover any character by which it could be distinguished from similar eruptive conditions prevailing at the same time in other cowsheds, and which were not associated with scarlet fever. Klein, however, held that the "Hendon disease" possessed differentiating features in the duration of the eruption, the regularity of contour of the lesions, the thickness of the scabs, the amount of induration round the sores, and the extent to which they were raised above the surrounding skin. These differences are, however, merely variations in degree, and are too ill-defined to give them a diagnostic value. In any extensive outbreak of cow-pox, variations equal in degree to those claimed as differentiating features may be found, depending on the severity of the attack, whether the vesicles of the sore remain discrete or become confluent, the amount of irritation caused by milking, and possibly also to secondary infection of the sores as the result of rupture of the vesicles or the removal of the scabs in the act of milking.

From the point of view of diagnosis, Klein at various times laid much emphasis on the co-existence of ulceration, scabs, and scurfiness of the skin with the loss of hair in patches. I do not propose discussing the various causes which may give rise to such lesions of the skin—suffice it is to say that the veterinarian was not then and is not now conversant with any disease of the cow characterized by the co-existence of these udder and skin lesions. Indeed, some doubt must remain as to whether skin lesions were even a constant feature of the cow disease at Hendon, for Professor Axe in his report to the Agricultural Department of the Privy Council of his investigations into the nature of the cow disease says: "In some exceptional cases it is stated to have been associated with scaliness and thickening of the skin about the quarters, and with loss of hair in patches." Whether

skin lesions were a constant feature of the Hendon disease or not, medical and lay inspectors in the course of subsequent investigations certainly arrived at a confident diagnosis of cow scarlatina in which no skin lesions were present, and in which neither cough nor loss of condition of the animals held responsible for the infectivity of the milk is recorded. Thus, in the report of the 1909 London epidemic it is stated that[1] "in no instance did we discover evidence of loss of hair in patches," and in the Glasgow report (1892)[2] "skin lesions were also absent."

Notwithstanding his assertions of the existence of differentiating features between the "Hendon disease" and other eruptive conditions of the teats and udders of cows Klein himself appears to have been unable to distinguish between them from their clinical appearances. In the Glasgow epidemic (1892) it was only after a series of inoculation tests that Klein discovered that the cows were affected with cow-pox, though because he found what he regarded as his specific streptococcus alongside several other species of organisms in lymph from the cows' teats, and produced a pustular eruption by the inoculation of calves with this contaminated lymph, the conclusion appears to have been arrived at that the cows were suffering from a mixed infection.

In some instances neither udder nor skin lesions appear to have been regarded as necessary to justify a diagnosis of bovine scarlatina. Dr. Parsons, in his report of the Macclesfield epidemic (1889) states that[3]: "The only circumstance that I have been able to discover fulfilling in point of time the requirements of the case is the addition on January 23 to the general stock of milk of that yielded by the cow which calved on January 20, and the only explanation which suggests itself as to how the milk of this particular cow came to have infectious properties is that the cow herself may have developed in the puerperal condition some ailment, so trivial, so evanescent as to have escaped the notice not only of her owner but also of the eminent veterinary authorities who at a later stage examined her." It is perhaps advisable to mention that the medical inspectors also examined the cows and were equally unable to discover any signs of illness amongst them. A postscript to the report states that the cows in question developed some pimples and vesicles on one of her teats some six weeks after the commencement of the human epidemic. She was

[1] Report of Drs. Hamer and Jones, 1909.
[2] Report of Drs. Russell and Chalmers.
[3] Report to the Local Government Board.

then suckling a calf which remained healthy, and the eruption did not spread to the other cows on the premises. It was therefore essentially different from the "Hendon disease." Notwithstanding, this case appears to have been confidently regarded by the Local Government Board officials of the time as one in which the responsibility for the human epidemic was brought home to the cow.

It must be obvious from what has been said that the alleged bovine scarlatina does not possess any characteristics which would permit of its diagnosis by any ordinary clinical examination.

The *post-mortem* appearances, as described by Klein, are of no greater value in establishing the occurrence of a specific disease. The Hendon cows which were examined showed on *post mortem* the following appearances: Slight pleuritis with recent fibrinous deposits and adhesions, congestion and extravasation in some of the lobules of the lungs, discoloured and softened patches in the liver, ecchymoses and petechiæ in the substance and in the capsule of the spleen, swelling and extravasation of blood in the lymphatic glands, congestion and glomerulo-nephritis of the cortex of the kidneys. However close the resemblance between these *post-mortem* appearances and those of scarlet fever of man, they are of little value as evidence of identity of the animal of human diseases, for exactly similar conditions are to be found in many septic diseases which do not bear the slightest resemblance to the alleged bovine scarlatina or to scarlatina of man.

The bacteriological investigations on which Klein based his theory of bovine scarlatina are equally unconvincing. Klein isolated a streptococcus from human scarlatina which he regarded as its essential causal agent. From the Hendon cows he also isolated a streptococcus from human scarlatina which he regarded as its essential causal agent. From the Hendon cows he also isolated a streptococcus which he concluded was responsible for the cow disease, and which he claimed to be identical with the streptococcus isolated from human scarlatina. He also claimed that by the subcutaneous inoculation of either of these streptococci the disease was reproduced in the cow and the bacteria were recovered from the teat and udder lesions of the experimental animals. He therefore concluded that the cow disease was caused by the same organism as human scarlatina, and that, in fact, it was scarlatina of the cow. If Klein's conclusions were correct it is most extraordinary that in the twenty-five years which have elapsed since he carried out his experiments no confirmation of his results has been forthcoming. To accept his conclusions as correct also means acceptance of the view that with the discovery of his streptococcus he

demonstrated the specific causal agent of scarlet fever. It is difficult to understand on what ground Klein thought himself justified in forming the opinion that his streptococcus was the causal agent of scarlet fever. Up to the present day, notwithstanding the advantage of a vastly greater knowledge of bacteriology, it has not been found possible to connect streptococci etiologically with scarlat fever. They are found with great constancy in the fauces in that disease and are responsible for most of its complications, but streptococci, indistinguishable from them, are also met with in the throat in other acute catarrhal conditions, and it seems highly probable that their effects in scarlet fever are secondary only to the action of a specific virus whose nature has yet to be determined.

It is remarkable that Klein's experiments to establish a relationship between the cow disease at Hendon and human scarlatina were limited to the injection of streptococci isolated from the cows, and those which he assumed to be the cause of scarlet fever. Had his results been tested by the experimental treatment of cows with scarlatinal material which undoubtedly possessed infective properties, and been found to coincide with those following the inoculation of the streptococci, his conclusions would have been placed on a firm basis. But we are not without knowledge of the results of the experimental treatment of cows with scarlatinal material. Klein, himself, in 1882, on behalf of the Local Government Board, attempted to infect cows with scarlet fever by inoculating and feeding them with scarlatinal material. His experiments absolutely failed, the only result being the production of a localized abscess following the subcutaneous injection of muco-purulent throat discharge—a not surprising result. Later, McFadyean carried out similar experiments on behalf of the Agricultural Department of the Privy Council, his experiments including the introduction of a large quantity of infective material into the genital passages of a newly calved cow. His attempts to infect the cow also proved abortive. A number of experiments were carried out by a committee on behalf of the Edinburgh Medico-Chirurgical Society with a similar object and a similar result. Loeffler, in Germany, also failed to produce the disease in cows by feeding and inoculation experiments. Moreover, not a single instance has been produced of the development of Hendon or other disease of the cow, as the result of the contact of attendants affected with scarlet fever, or who have been in close contact with scarlatina patients and were known carriers of infection. This is not because of the lack of occasion, for opportunities of infection in this way have occurred time and again.

The appearance of the cow disease, if it be really scarlatinal in nature, must bear a distinct relationship so far as time is concerned with the appearance of the resulting human disease, but a time relationship, though a point of the highest importance in establishing an etiological connection between the two, has never been shown to exist. Even in the North London case attributed to the cow disease at Hendon, and on which the foundations of the bovine scarlatina theory may be said to have been laid, it is clear from the recorded dates, which were undisputed, that the cow disease was in existence on the Hendon farm for a fortnight before the commencement of the human disease, the incubative period of which varies from one to six days. The Glasgow epidemic of 1892 is even more striking, the cow disease to which the infectivity of the milk was attributed having been in existence for a month before the the milk became infective. Further comment is unnecessary, it must rest with those who support the theory of cow scarlatina to explain the non-infectivity of the milk between the appearance of the cow disease and the commencement of the human epidemic.

Before leaving this point it is necessary to refer to the London epidemic of 1909, because the reporters assert that the appearance of the cow disease and the human epidemic synchronized. One searches the report in vain, however, for evidence in support of this conclusion, which is based on the assumption that the disease was introduced into the herd by a particular newly calved heifer. There is not a single scrap of evidence to show that she introduced the disease, and that she was not infected after her introduction. There is room for the greatest doubt as to the correctness of the author's conclusions both on this point and as to the date on which the milk of this heifer is said to have been first used. For five or six weeks after the opening of the inquiry, the milkers contradicted one another as to the date on which her milk was first added to the general stock, and the only ascertained facts with reference to this heifer were that she had calved about May 24, and that her calf had died four or five days later, which means, having regard to the customs prevailing on the farm, that her milk would first be used a week before the date (June 7) fixed by the authors, and the same length of time before the milk was regarded as having become infective.

Perhaps the weakest point in the whole of the case against the cow lies in the fact that in not a single instance has any explanation, which will bear investigation, been offered of the manner in which the cows contracted the disease. Spontaneity of origin must be negatived.

In the absence of the introduction of new stock, a suggestion of human infection must also be negatived, for in every instance in which scarlet fever has been attributed to animal infection, human sources of infection have been first sought for, and it is believed eliminated. In more than one case the alleged bovine scarlatina has been introduced by a newly purchased cow, and in not one single instance has a scarlatinal epidemic existed in the district from which the cow has been removed, nor amongst the consumers of the milk of her former companions similarly affected. The Hendon case again affords an excellent illustration. The cow disease alleged to have caused the human scarlatina was admittedly introduced into the Hendon cowshed by three cows purchased from a lot of thirty belonging to a dealer. The remaining twenty-seven cows, the majority of which were affected with an udder condition indistinguishable from that of the Hendon cows, were sold in lots of from one to eight within a few days, and distributed over a number of cowsheds. Both before and after sale and throughout the whole period of the cow disease, with which they infected their new companions the milk from all the cows was sold in the ordinary way. Notwithstanding the most careful inquiry in the districts to which their milk was consigned, no complaint had arisen as to its wholesomeness, no case of scarlet fever attributable to milk could be found, and the medical officers of health of the districts certified to the absence of any epidemic at the time.[1] Again, if cows are affected with a disease capable of giving rise to scarlet fever in man, the sale and distribution of the affected animals should be followed by a series of scarlatinal epidemics in the new districts in which their milk is distributed. But this has not been so. The Wimbledon and Merton epidemic of 1886, which was attributed to disease of the cows, may be cited in illustration. On visiting the farm involved, Power found that the whole herd of forty-one cows had been sold, and seventeen had already been removed from the premises, and[2] "of those remaining, some few appeared to be recovering from an affection of the skin and udder, very similar to the malady reported on by Dr. Klein as having occurred amongst certain cows at Hendon." In view of the fact that scarlet fever did not follow the distribution of these cows, it must have required a considerable amount of courage on the part of the inspector to attribute the infectivity of the milk to disease of the cows.

In the report of the London epidemic (1909) the suggestion is

[1] Report of Professor Axe to Agricultural Department of Privy Council.
[2] Report to the Local Government Board.

made that the bovine scarlatina had its origin in the use of feeding cakes, a suggestion which is altogether unworthy of its authors, and one which is so improbable that it does not merit discussion.

The position for and against the theory of bovine scarlatina may be summarized as follows :—

For.—Failure in certain milk-borne epidemics of scarlet fever to trace human infection.

The co-existence of scarlet fever in man, and of an eruptive disorder of the teats and udders of cows.

Klein's discovery of a streptococcus in the lesions of the teats and udders of certain cows at Hendon which he regarded as identical with a streptococcus isolated from human scarlatina and assumed to be the cause of that disease. With both streptococci he claimed to be able to reproduce the cow disease.

The similarity of the *post-mortem* appearances of the Hendon cows and of Klein's experimental animals with those of human scarlatinal patients.

Against.—It requires more than the failure to trace infection to human sources to justify, attributing it to animal sources.

The human and animal diseases have not occurred synchronously.

There is no reason for believing Klein's streptococcus to be the specific organism of scarlet fever.

The *post-mortem* appearances are common to a number of dissimilar diseases.

All attempts to infect cows experimentally with scarlet fever have failed, and there is no known case of infection of cows as the result of accidental contact with infected persons.

Veterinarians, British and Continental, are unanimously of opinion that the cow is not the subject of scarlatina.

In conclusion, the following opinions of British and Continental authorities may be quoted :—

"The alleged cow scarlatina has failed to establish a place for itself in veterinary pathology, and except among medical officers of health in Great Britain, belief in the occurrence of such a source of human outbreaks has within recent years steadily lost ground." —McFadyean, *Journ. Comp. Path. and Therap.*, vol. xxii., p. 341.

"After an examination of the evidence on both sides of the question, we are of opinion that the case for cow scarlatina was not proved."—Swithinbank and Newman, "Bacteriology of Milk," p. 289.

"Scarlet fever was not communicable from man to animals. . . .

With regard to Klein's experiments, the general opinion in Germany was that Dr. Klein had confounded the disease in question (Hendon disease) with either cow-pox or foot-and-mouth disease."—Ostertag, Seventh International Congress on Hygiene, 1891."

"It is strange that this old fallacy should have recently again cropped up by the assertion that scarlet fever of man is produced by the milk of cows suffering from scarlet fever. . . . We may point out that cows are absolutely immune to scarlet fever."—Friedberger and Fröhner, "Veterinary Pathology" (Haye's transl.), vol. ii., p. 650.

"About eighteen years ago some scarlet fever epidemics aroused great attention in England . . . from the evidence that is now available, one is justified in regarding it as established that the outbreaks of scarlet fever in question had no relation to disease in cows."—Jenson, "Milk Hygiene" (Pearson's transl.), p. 115.

Diphtheria.

If it can be said with truth of scarlet fever that belief in the bovine origin of such human outbreaks has been steadily declining during recent years, the remark may be made with still greater truth of diphtheria. The fact that the causal agent of this disease is well known and recognizable, has contributed in no small degree to this change of opinion. In part also it is due to the fact, unknown and probably unthought of, in the early days of the bovine diphtheria hypothesis, that patients recovered from diphtheria very commonly harbour the causal organism of that disease in the throat or nose for several weeks, sometimes for indefinite periods varying from one hundred to three hundred days, and that so long as the organisms remain present, the patient, though apparently completely recovered, continues to act as a centre of infection. These organisms are frequently of low virulence, but under favourable conditions are capable of returning to the more virulent type.

Further, it is now known that the same organism may be found in the throat or nose of those who have been nursing diphtheria patients, or in close contact with them, and also, though with much less frequency, in the throats of apparently healthy persons who have not suffered from diphtheria, and who, so far as is known, have not been exposed to infection.

A series of diphtheritic, though apparently innocent sore throats, whose real nature can only be determined by a bacteriological examination, are found in association with all diphtheria epidemics,

and the hosts of the bacillus are sometimes inconvenienced by its presence to such a small degree that their daily duties are performed without interruption, and they are regarded merely as the victims of a slight catarrhal cold.

These facts are placed before you because the bovine diphtheria hypothesis had its inception originally in a failure to trace infection of milk to human agencies, and they illustrate the extreme difficulty which exists in completely eliminating human sources of infection. They explain the ease with which the diphtheria bacilli may be transferred from persons apparently healthy, or, as more frequently happens, affected with what appears to be a slight harmless cold, to lesions or sores on the teats of cows in which their presence may be demonstrated, but for the occurrence of which they are in no way responsible. They emphasize the necessity of experimental tests in all cases in which diphtheria bacilli are found in abnormal teat or udder conditions, to show whether their presence is accidental or the essential cause of the cow condition. Without experimental tests there is absolutely no justification for the conclusion that the abnormal conditions of the udders and teats of cows are the result of the action of diphtheria bacilli because they have been found in the lesions. It is my opinion that experimental tests will, as they have done in the past, absolutely fail to produce evidence in support of the view that cows are naturally the subject of a disease caused by the Klebs-Loeffler bacillus, and capable of infecting human beings with diphtheria through the agency of the milk.

In the earliest days of the bovine diphtheria hypothesis, mammitis was regarded as capable of inducing diphtheria amongst the consumers of the milk with which the abnormal secretions of the diseased gland had been mixed. The epidemic at Rugby school in 1881 was so attributed, but at that time bacteriology was in its infancy, and the Klebs-Loeffler bacillus as the cause of diphtheria unknown. Since that time many investigations have been made into the cause of mastitis in cows, without having produced any evidence to show that the diphtheria bacillus is ever a cause of mastitis, or that any etiological relationship has ever at any time existed between inflammation of the cow's udder and diphtheria of man. Exceptionally, diphtheroid bacilli, morphologically indistinguishable from the diphtheria bacillus, have been found in association with other organisms in the secretions from, and in the parenchyma of, inflamed udders of dairy cows, but so far as the question at present under consideration is concerned, their presence has no

significance, because cultural and inoculation tests have shown them to be essentially different from the causal bacillus of diphtheria. More frequently similar diphtheroid bacilli, differing from the diphtheria bacilli in their cultural characters, and in their pathogenicity for animals, have been isolated from sores on the teats and from healthy teats of apparently perfectly healthy cows.

Klein, in the reports to the Local Government Board on his investigations into the cause of diphtheria (1888-89, 1889-90), was the first to bring forward what appeared to be material evidence in support of the hypothesis that the cow was the subject of diphtheria, and by means of her milk able to convey the disease to man. He held that diphtheria of the cow was manifested by an eruption on the teats and udders of the animals affected, and claimed to have isolated the bacillus from the teat eruptions and from milk obtained direct from the gland uncontaminated from outside sources. He based this view on the results of the experimental inoculation of cows with bacilli isolated from human diphtheritic membranes. The inoculations were made into the subcutaneous tissue of the shoulder, and resulted in a painful diffused swelling at the seat of the inoculation and beginning about the fifth day, in the appearance of a vesico-pustular eruption on the skin of the udder and teats, running its course in from six to eight days, and appearing in successive crops. The experimental cows were obviously ill, they showed an evanescent rise of temperature on the second or third day, and the majority either died or were killed in a more or less moribund condition after ten to twenty-five days. The bacilli were recovered from the udder lesions, and in two cases from the milk. The udder eruption was not constant; it appeared in four out of eight cows inoculated.

These experiments of Klein's cannot be regarded as of any value for or against the bovine diphtheria theory for several reasons. In the 1888 portion of his report Klein casts doubt on the specificity of the Klebs-Loeffler bacillus, and the organism with which he worked varied in its cultural characters from those of the bacillus now universally recognized as the organism of diphtheria, notably in growing well on gelatine at 20° C. A feature of the Klebs-Loeffler bacillus appears to be its localization to the seat of inoculation, whilst a striking result of Klein's experiments was that the bacilli entered the circulation and appeared in the udder eruption, and in two cases in the milk. The limited number of his experiments on cows and his inconstant results scarcely justified the general conclusion that a vesico-pustular eruption was a feature of bovine diphtheria, assuming that such a disease

exists. Subsequent investigators have failed to confirm Klein's results. It is therefore not surprising that his conclusions have come almost universally to be regarded as having been founded on error.

It was nevertheless characteristic of the period in which Klein carried out his investigations to attribute the origin of milk-borne diphtheria as well as other milk-borne epidemics to co-existent eruptive disorders of the udders and teats of dairy cows; and in 1890 Klein refers to two such outbreaks at Croydon and Bishop's Stortford, in which the cows on the farms supplying the infected milk were affected with [1] "a contagious, ulcerative eruption on the teats very like that occurring in the cows experimentally inoculated by me with cultivations of the diphtheria bacillus." Those epidemics, as well as the Worcester outbreak of 1891, and that at Glasgow in 1892, are recorded as having been of bovine origin, but as evidence of the occurrence of bovine diphtheria they are valueless, since in none of them was the presence of the diphtheria bacillus demonstrated in the milk or in the teat or udder lesions. Klein's note on the "cases of causal diphtheria in the cow" at Croydon and at Bishop's Stortford contain no reference to a bacteriological examination. In the Glasgow case the "Hendon streptococcus" was isolated from lymph taken from the teat lesions, whilst experimental inoculation was said to have shown that two varieties of eruption existed, one being true vaccinia, and the other a non-vesicular eruption like that of the Camberwell outbreak, which, it may be said. was not associated with diphtheria. The evidence connecting the cows with the human disease in the Worcester case is on a similar footing.

It was, therefore, purely an assumption to have regarded these diphtheria epidemics as in any way dependent on the teat and udder conditions of the cows, an assumption based apparently solely on the co-existence of these conditions.

Swithinbank and Newman [2] state that the cases in which the *Bacillus diphtheriæ* have actually been isolated from milk are extremely few, and they cite four cases which they state are the only authentic instances of actual detection of the bacillus of diphtheria in ordinary milk with which they have met. Only one of these was associated with an abnormal condition of the teats and udders of cows. Two cows were involved, and both showed papules and ulcers on the teats, covered with dark brown scabs. In one the udder and the secretion of milk were normal, and in the other one posterior quarter was

[1] Local Government Board Report.
[2] "Bacteriology of Milk."

affected with mammitis, the secretion being ropy, purulent-looking, and tinged with blood. Drs. Deans and Todd, who conducted the bacteriological investigation of this case, isolated from the teat lesions bacilli morphologically, culturally, experimentally, and, in their degree of virulence, were indisguishable from those obtained from the throats of the diphtheria patients, and against the effects of which experimental animals were protected by the previous administration of diphtheria antitoxin. They also isolated identical bacilli from the milk of both of the cows, drawn with all antiseptic precautions, notwithstanding that the udder of one appeared to be normal. Experiment showed, however, that the organisms were not the cause of the udder lesions. The cow disease was readily communicable to calves, but the calves were not protected by the previous administration of diphtheria antitoxin, and the conclusion of the investigators was to the effect that the cows were affected with a specific eruptive condition apart from the diphtheritic infection, but that there were no means of determining the manner in which the bacilli of diphtheria obtained access to and multiplied in the lesions of that disease, though they appear to have regarded it as probable that the saliva of the attendants was not free from responsibility.

Deans' and Todd's investigations suggest the possibility of the diphtheria bacillus multiplying in the healthy udder without producing evidence of its presence; in other words, of existing there practically as a saphrophyte. It has yet to be shown whether or not the *B. diphtheriæ* are capable of existing saphrophytically in the healthy udder, but even if they are proved to be capable of such an existence, the fact is not one which would afford support to the bovine diphtheria hypothesis.

I have been completely unable to find any real grounds on which a theory of bovine diphtheria could be based. So far as any part which the cow may play in the dissemination of diphtheria is concerned, the whole weight of evidence points to her acting merely as a convenient stepping-stone, by means of which the bacilli of diphtheria may pass from the human mouth into the milk pail.

In conclusion, the same authorities referred to in connection with scarlet fever may be quoted:—

"Only a person in absolute ignorance regarding the bovine diseases encountered in this country can imagine that diphtheria is a disease occurring naturally in the cow and transmissible from one animal of that species to another."—McFadyean, *Journ. Comp. Path. and Therap.*, vol. iii., p. 166

"Up to the present, it may be said that the evidence forthcoming points in the direction of human rather than bovine infection as the origin of the *B. diphtheriæ* in milk."—Swithinbank and Newman, "Bacteriology of Milk," p. 339.

"The cases recorded in medical literature of the alleged transmission of infection (of diphtheria) . . . are on closer examination reduced to mere assumptions, the forming of which has been due to an entire ignorance of veterinary pathology."—Friedberger and Fröhner, "Veterinary Pathology" (Haye's translation), vol. ii., p. 414.

"The bacillus of diphtheria must come directly or indirectly from the oral cavity of people who are or have been recently attacked with diphtheria. . . . The opinion that was held formerly by some that diphtheria in man could come from a disease of milk cows is entirely erroneous."—Jensen, "Milk Hygiene" (Pearson's translation), p. 114.

Sore Throat.

It is a matter of common knowledge that a considerable number of cases of sore throat occur in association with the majority of scarlet fever epidemics, whether milk-borne or not, and that the two occur not infrequently in the same household. There is no room for doubt that a close relationship exists between the two. The same holds good for diphtheria. A type of sore throat, however, apparently quite distinct from either of these two diseases, is met with in human beings. It is characterized by congestion and inflammation of the tonsils, sometimes ulceration, enlargement of the cervical glands, fever and general depression, without other evidence of specific infection.

This condition is not notifiable, but its occurrence at times endemically or epidemically has resulted in special inquiries being instituted to trace the source of infection, and as with the two diseases already dealt with, the conclusion has been reached in certain instances in which milk has been shown to be the medium of infection, that abnormal conditions of the cows furnishing the milk have been responsible for its infective properties. Bacteriological evidence in support of this conclusion cannot be found, however, and consequently definite proof of a causal relationship between the human and animal conditions is wanting.

Inflammatory conditions of the udder have been most frequently found in association with these epidemics and have been held responsible for the infectivity of the milk, but eruptive conditions of the

skin of the udder and teats have also, though less frequently, been regarded as the primary cause of the human condition.

Probably it has been the experience of every inspector of dairy cows to find that the secretions from an acutely-inflamed udder have been added to the general stock of milk sometimes for several weeks in the intervals between visits of inspection. Such instances are fortunately uncommon, and almost invariably when the secretions from an inflamed quarter have undergone obvious change, they are rejected by the dairyman independently of the inspector. Given a case of mastitis, however, involving one quarter of the udder only, the custom almost universally prevails of mixing with the general stock of milk that secreted by the healthy quarters, since to all appearances it is perfectly sound. It has recently been shown that micro-organisms indistinguishable from those causing the mammitis may be found almost constantly in the teat canals and in the milk sinuses of the healthy quarters, where they produce no morbid change and no alteration in the milk. It thus follows that if mastitis be a cause of human sore throat, large quantities of milk which are a potential source of infection are distributed and consumed daily.

In subacute catarrhal mammitis there is no apparent change in the milk when first drawn from the udder, but if "set up" for a few hours it shows a marked departure from the normal, and on examination is found to contain streptococci in large numbers. This condition is by no means uncommon, and until the attention of the dairyman is drawn to it the secretions of the affected quarter or quarters are invariably added to and distributed with the milk.

Similarly in eruptive conditions of the skin of the teats. I very much doubt if it is possible to examine a herd of dairy cows of any dimensions without finding several with lesions on the teats, and there are probably few veterinary surgeons who have not had experience of eruptive conditions of the teats of dairy cows communicable from one animal to her neighbour by the hands of the milkers, in which for weeks the milk drawn from animals in all stages of the affection has been distributed in the ordinary way and consumed by human beings without any coincident sore throat or other epidemic.

Experience of this description forces upon us the conviction that if mastitis or eruptive disorders of the udders and teats of dairy cows are capable of producing sore throat amongst the consumers of the milk, the great majority of such cases are not capable of so doing, for if they were at all commonly a cause of sore throat in man, it is obvious that epidemics of that condition would be of very much greater frequency than they are.

The only bacteriological evidence which is available on this question supports this conclusion. Savage[1] has recently carried out a series of investigations into the bacteriology of mastitis and the etiological relationship of that condition to human sore throat. He found that in 75 per cent. of the cases of mastitis which he examined, the causal organism was a streptococcus occurring in long chains, and possessing a very low virulence for guinea-pigs and mice, but inducing, when injected up the teats into the udders of goats, a severe mastitis with long-continued infection of the udder. To this organism he applied the name *Streptococcus mastitidis.* In one of his experiments he injected into the udder of a goat streptococci from a sore teat, with the result that an extremely severe mastitis was produced, with marked general symptoms and long-continued persistence of bacteria in the udder.

Simultaneously, an investigation of the organisms met with in human sore throat was made, and confirming the results of previous investigators, Savage found that two chief types of streptococci prevailed—the *S. pyogenes* and the *S. anginosus*—the latter being the more common, and corresponding to the streptococcus which exists in large numbers in the throats in scarlet fever.

He showed that culturally and morphologically the *S. anginosus* is indistinguishable from the *S. mastatidis*, that experimentally it possesses considerable virulence for mice, and that it is incapable of originating mastitis in goats. The effects of the *S. anginosus* when inoculated into the udder of goats thus afforded a means of differentiating it from the *S. mastitidis*, and Savage suggested as a practical point that the best way to determine if outbreaks of human disease were spread by streptococci associated with inflammatory cow conditions was to isolate the streptococci from the human disease and see if they would cause mastitis in goats by inoculation up the teats. If they were of milk origin they should produce mastitis in goats. These results suggested to Savage that the *S. mastitidis* is not a cause of human disease.

Bacteriological evidence, therefore, so far as it is available, does not support the belief that human sore throat has its origin in mastitis or teat lesions of the cow. But the evidence is not sufficient to permit of the complete exclusion of these conditions as causes of human sore throat. The many investigations into the bacteriology of mastitis in cows have shown that different varieties of bacteria may be the cause

[1] Local Government Board Reports, 1906-07 and 1907-08.

of that condition in cows. Streptococci undoubtedly are most frequently responsible, and whilst one type predominates, several other varieties have been distinguished. Staphylococci are less frequently found, and are usually associated with the milder forms of mastitis. Still less frequently bacilli, usually of the coli type, are met with. Not uncommonly several different types of organisms co-exist in the secretions from an inflamed udder, making it difficult to determine which has been responsible for the morbid conditions. (Specific conditions, as tuberculosis, are not at present under consideration.) It is conceivable that one or more of these types of bacteria may be capable of producing sore throat in man, but I have seen no report of a sore throat epidemic which had its origin in infection through milk, in which the facts brought to light in the course of the investigations have established an etiological relationship between the human conditions and either mastitis or sore teats in cows.

There is another point which is of importance in this connection. Staphylococci and streptococci, bearing a close resemblance to those which are a cause of mastitis except in their pathogenicity for animals, may be found in the teat canals and milk sinuses of perfectly healthy udders. Their numbers vary within wide limits, but they are rarely absent. Since they are found with such great frequency very few can, and probably none do, possess pathogenic properties for man. They appear to be purely saphrophytic. The demonstration, therefore, in the throats of human patients infected by milk, of bacteria culturally and morphologically similar to those found in the udders, whether apparently healthy or not, of cows on the premises from which the infected milk is obtained, falls very considerably short of proof of an etiological relationship between the human and animal conditions.

Whilst the experience of veterinary surgeons inspecting dairy cows and the bacteriological evidence available do not support the view that a relationship exists between human sore throat and morbid conditions of the udders and teats of dairy cows, the question is one which can only be definitely settled by time and the most careful investigations of human epidemics carried out by highly trained observers as opportunity offers. But whether or not it is ultimately proved that an etiological relationship sometimes exists, all will agree that the milk of cows affected with mastitis in any form, or with teat conditions in which discharges or material from the teat lesions are liable to find their way into the milkpail, should not under any circumstances be permitted to be sold and used for human food.

A FEVER IN HORSES SIMULATING HORSE-SICKNESS.[1]

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BEFORE the war, and repeatedly since then, I have come across a fever in horses which simulates horse-sickness in a certain respect, but differs from it inasmuch as no horse succumbs. I called it "ephemeral fever" to indicate its mild character. It needs hardly to be said that, besides this fever, there are still others met with in horses, also excluding biliary fever and horse-sickness, and which may be specific, but they have not yet formed the subject of such a close study as that under discussion, which was met with under peculiar circumstances. The term "fever," in its restricted sense, means only a symptom of a disease, that is, the high temperature which indicates a reaction of the animal's system to some obnoxious influence. "Fever," in its wider sense, may also stand for the word "disease," as, for instance, in the term "biliary fever." In speaking of "ephemeral" fever, I use the term in this, its wider sense, meaning a disease, and indicating at the same time that the fever is the main symptom, other characteristics which might suggest another name being absent. "Ephemeral fever" therefore indicates a certain morbid condition of horses which cannot be recognized with accuracy in the first instance, and which has practically but little economic importance.

Cause of the Disease.—Since bacteria and protozoa cause infections which are accompanied by fever, we naturally suspect in all fevers the presence of organisms. The microscopic examination of blood of horses during the acute stage of this fever gave negative results. The blood spread out on different culture media with the object of growing the supposed micro-organism, also gave negative results, notwithstanding that large quantities were used both for aerobic and anaerobic cultures. This proves that the disease is not caused by bacteria, which, had they been present in the blood, if only in small numbers, could not have escaped observation in this way. The fever, however, is transmissible by the inoculation of blood of an animal suffering from it, and during the whole time the disease lasts. A small quantity of blood is sufficient to reproduce it in the injected animal after both subcutaneous and intrajugular injections. A further peculiarity is that blood which is conserved with preservatives also retains the virulency for a considerable length of time.

[1] From the *Transvaal Agricultural Journal.*

Further, the serum which has been separated from infective blood transmits the disease. Finally, if such serum be filtered through a Berkefeld filter, which retains the usual visible micro-organism, it is observed that the filtered liquid still reproduces the fever, making it apparent that the virus belongs to the group of ultra-visible micro-organisms which cannot yet be detected even by the highest magnification of our present microscopes. These facts give the cause of the fever a striking resemblance to horse-sickness, even in details. The question had therefore to be taken into consideration whether it could not be identical with horse-sickness, being only of a milder character and representing some peculiar strain, as we know by this time that strains vary greatly in virulency, a fact which makes it so difficult to obtain immunity against this disease. For this reason it was considered necessary to prove its identity, or otherwise, with horse-sickness.

DIFFERENTIATION OF HORSE-SICKNESS AND EPHERMERAL FEVER.

One of the characteristics of horse-sickness is the incubation time, that is, the period which elapses between the infection of the animal and the first rise of temperature. It is true that it varies in length, and that in the acute form it is shorter than in the sub-acute forms, but it has an average length of eight days. The ephemeral fever has a shorter incubation time, averaging almost regularly five days; it may be shorter than this, but is very rarely longer. In horse-sickness, as a rule, the fever rises gradually, increasing daily one or more degrees until it has reached the climax when either the animal collapses and dies suddenly, or, just as the fever has been rising by degrees, it descends again by degrees, and the descending curve resembles very much the ascending one. This period of fever in the recovering animal lasts very rarely less than a week, and usually ten days. In ephemeral fever we notice something similar, but the rise of the temperature is more abrupt, and the climax is reached within a much shorter time. The fever does not last long and soon descends, so that the whole length of the fever does not average more than about four or five days. The acute ephemeral fever therefore does not resemble in its curve the acute fever of horse-sickness. There are, however, exceptions to this general rule, where the fever curve resembles that of horse-sickness to such an extent that, even by more close comparison of the two, a diagnosis would be impossible. In horse-sickness a sudden dropping of the temperature invariably means the approach of death, but such is not the case in ephemeral

fever, where the temperature can drop from its climax to normal within one day, and yet we notice nothing which would resemble the collapse in horse-sickness.

The ephemeral fever is accompanied by an increase in the activity of the heart. During its sudden rise, and whilst it is high, the number of beats is increased. In acute cases this increase numbers eighty beats and more, and at the same time the quality of the pulse is somewhat altered, the individual pulsation being hurried and soft, so that at a given moment, and considering the high fever, one is inclined to make a bad prognosis. In addition to this a slight increase in the number of the respirations is occasionally noticed; the character of these, however, is never such as to lead one to suspect the presence of horse-sickness. In examining the mucous membrane of the eyes, occasionally a slight injection of the membrane, or diffuse reddening is observed. The horse may even be noticed to be off his feed, standing somewhat drowsily at the manger, and will be found to be less spirited than usual. The presence of these symptoms, of course does not allow of an immediate definite diagnosis as they may initiate many diseases which can only be diagnosed by the course of further events. For differential diagnostic purposes the quality of the pulse may be taken into consideration. In a case of horse-sickness, with such a rapid pulse as in ephemeral fever, we usually get a rapid respiration at the same time, which leaves but little doubt about the character of the disease, or the symptoms of dikkop are present, which also is typical. The bilious fever in horses begins somewhat similarly, also with a high temperature and a frequent pulse, but on examination of the mucous membrane of the eye we find almost regularly the jaundiced condition which is typical of this disease, or if not yet present, it develops at least within twenty-four hours and becomes so pronounced that the disease can be diagnosed. Although we now differentiate this disease from horse-sickness, which it resembles in many ways, yet the absolute certainty of their dual nature we obtained only by experiment. Theoretically speaking, the characters mentioned were not sufficient to settle the question of the identity or non-identity, because we know certain horse-sickness strains have certain peculiarities both in the length of incubation time and in the length of the disease itself. More decisive points had to be looked for to demonstrate their non-identity. We know of horse-sickness that when we inoculate a large quantity of virulent blood into the jugular vein of a susceptible animal, that this disease appears without an incubation

time, and the course is so rapid that the animal invariably dies within a very few days. The same experiment with ephemeral fever, whereby the blood of one horse suffering from the fever was transfused into a susceptible one, in quantities of 5 litres, produced nothing more nor less than the fever. It was impossible to kill a horse with this fever.

The Immunity Reactions.—Before entering into the question which may be considered to be the most important—whether an animal which has recovered from this ephemeral fever has obtained immunity against horse-sickness—it has to be stated first that an animal immunized against ephemeral fever remains immune against a subsequent injection of the same strain. Undoubtedly a fever caused by the smallest quantity of virus protects against a subsequent inoculation of a large amount of virus of the same strain. We may say the immunity is complete against the particular virus which has formed the subject of the experiment. Approaching the question of the immunity against horse-sickness, a fact must be remembered to which I have referred in the past in various articles on immunity in horses and mules, viz., that an immune horse or mule may break down in immunity when we use a strain of virus different to that which has been used for the immunization of such an animal. It is true that there are horses and mules for which the immunity obtained by one strain is sufficient to protect against any other subsequent inoculation of different strains, but there are also horses and mules which react not only once, but twice, and even more times, to subsequent inoculations. In order to emphasize this, I have pointed out cases showing that horses and mules can, in a period of a few weeks, suffer three times from dikkop. In scientific research use is generally made of the principle that immunity obtained by the injection of micro-organisms protecting against the injection of a similar micro-organism of different origin indicates that both are identical. This principle has lately been applied in the identification of the various trypanosoma diseases. It does not hold in horse-sickness as we have just demonstrated above. This point has to be taken into consideration, and a breakdown in immunity does not necessarily exclude the non-identity of two micro-organisms, or of two diseases. Experiments on those lines are then of value when they are undertaken on a fairly large scale; coincidences may then be excluded by statistics. This was the case with our ephemeral fever, where subcutaneous and intravenous injections were made use of; the virus was injected in small and large quan-

tities, and the animals immune to ephemeral fever were then submitted to test by horse-sickness virus, of which the various strains were used. In no instance was there the slightest indication of any immunity obtained by the ephemeral fever, and the horses contracted and suffered from horse-sickness just as horses known to be highly susceptible to this disease. The reverse experiments were also carried out. Horses immune to various strains of horse-sickness were injected with small doses of ephemeral fever virus, and in every instance this fever appeared, and in no way differed from the fever met with in the susceptible animal injected in the same way. Therefore no doubt can be left that these two diseases are of different nature; the one a very harmful disease, and the other harmless.

Origin of the Disease.—It will be interesting to note how we came across this ephemeral fever. I may state that we met it in some instances occurring spontaneously in horses which were running outside during the day, and which were placed in a stable at night. It is the routine procedure of the laboratory to take the temperatures of all animals twice a day—in the morning and evening — and whenever it is found that any fever is present, the horse is thoroughly examined and the blood immediately placed under the microscope. When a diagnosis is not possible, inoculation experiments are then undertaken. Further, we came across it in a mule suffering from horse-sickness; the animal was recovering from dikkop, and for the purpose of obtaining a fresh horse-sickness virus, it was bled and the blood injected into another animal. It happened that the doses of virus which were injected were not sufficient to produce horse-sickness, but this ephemeral fever described. When the same strain of horse-sickness virus from another animal was used, the same animal contracted horse-sickness, proving that the previous mild reaction was not identical with this disease. This experiment indicates that more than one organism may be present in one and the same animal at the same time. This particular association we have difficulty in explaining at the present time otherwise than by accepting a mere coincidence. Further, we came across the disease in horses which were exposed during the night in a locality where horse-sickness was known to exist; the exposure was made for the purpose of giving the animals horse-sickness in the natural manner, and one of them contracted this fever. It was somewhat long in reaction, resembling the horse-sickness reaction more than any other, but there was no doubt that it was this ephemeral fever and subsequent inoculation supported the diagnosis. This one experiment threw

some light on the manner in which the disease may be contracted. I have but little hesitation in stating that it must be contracted in somewhat a similar way to horse-sickness. Although I have proved, or think to have proved, that ephemeral fever and horse-sickness are quite different diseases, yet there may have existed at one time a certain relationship between the two. If we believe in the evolution of organic life, we can apply the principle to the micro-organisms of diseases as well, and accept the view that the differentiation took place at an early period, one developing into the fatal horse-sickness and the other one into the mild ephemeral fever. Of course, these are theories, but they permit of an understanding of certain phenomena which are difficult to explain.

I have indicated that we obtained the ephemeral fever from different sources, and one may rightly bring forward here the question whether all these various fevers were identical with each other, or whether the various ephemeral fevers represent as many entities of their own. Accordingly the immunity test was applied again, that is to say, the immunity obtained from the one source was tested against that of another source. Now we noticed exactly a similar thing to that to which we drew attention before occurring in horse-sickness. There does exist an immunity, generally speaking, that is to say, the majority of animals injected with the virus of one source were protected against the one from the other source. There were exceptions to this rule, and some horses reacted to both injections, thus proving that not every horse has obtained immunity by the one injection. Finally, the question arose, always having in mind a difference in virulency, and the difference in the susceptibility of the horses, whether animals protected against ephemeral fevers of different sources would be protected against horse-sickness. All experiments in this respect failed again.

The practical conclusion from this short *exposé* may be considered to lie in the fact that animals may suffer from a very acute and high fever without this fever interfering at all with the health. It is generally believed that a high fever indicates a serious state of affairs in the economy of an animal. Speaking generally, this is true, because most diseases which end with death are accompanied by high fever, but the reverse does not hold good. Not every high fever means death, and accordingly it shows that there is a difference between the cause of the fever and the cause of death. We differentiate between a pyrogenous[1] and a toxic[2] agency. The former acts

[1] Producing heat. [2] Poisonous.

principally on the nervous centres regulating the body temperature, and the latter attacks and disturbs the vital parts.

The treatment of the fever, as such, is therefore not so necessary as it is generally thought to be, and if by the administration of drugs it can be reduced, it does not follow that the toxic effect is done away with. At the same time, if that was the case, the treatment of all diseases would be a comparatively easy thing, because we are to a great extent able to reduce fever, but nevertheless the animals die.

The second practical inference from these observations is that at the time when horse-sickness occurs, fevers are occasionally met with in horses which laymen consider to be horse-sickness, and when they observe the symptoms which we have described, and the animal has recovered, they are under the impression that the animal is salted against this disease. Unfortunately we are not yet in the position to differentiate in practice between the mild attack of horse-sickness and the ephemeral fever, and it is therefore quite natural that not only laymen, but experts, may come to the conclusion that certain fevers are cases of horse-sickness when indeed they are not of this nature.

SWINE ERYSIPELAS.[1]

This disease may be defined as a contagious disease of swine caused by the bacillus of swine erysipelas.

Prevalence.

The investigations which have been conducted in connection with swine fever have shown that swine erysipelas, particularly in its milder forms, frequently affects pigs in Great Britain, and that in a certain proportion of cases it is the cause of death.

During the last three years records have been kept by the veterinary officers of the Board regarding outbreaks of disease which were reported as suspected swine fever and afterwards found by the visiting veterinary surgeon to be swine erysipelas. These records, which extend to 1,200 such outbreaks annually, show that at least one pig died in each case.

This figure, however, cannot be taken as nearly representing the annual number of outbreaks of swine erysipelas, because in most cases the diseases assumes a mild form, and there must be many other out-

[1] Leaflet issued by the Board of Agriculture and Fisheries.

breaks in which a pig has died without raising a suspicion of swine fever, in which case the fatality would not be reported to the Board. The disease is most frequently met with in fat pigs—that is to say, at a somewhat later age than that at which they are most usually attacked by swine fever.

SYMPTOMS.

Acute Cases.—In acute cases of swine erysipelas the animals show the usual signs of severe illness in the pig—viz., rise of temperature, shivering, loss of appetite, and vomiting. In such cases a fatal termination may take place in twenty-four to forty-eight hours, but the animals frequently live much longer. In the less acute cases a red patchy eruption, from which the disease gets its name (erysipelas), appears on the buttocks, thighs, body, and ears.

The breathing is very rapid, and the swine stagger about when made to walk. Ultimately they lie prostrate in the litter and die comatozed.

Mild Cases.—In mild cases the general symptoms are not marked; the swine appear to be out of sorts, and show the usual skin eruption, which is sometimes called nettle rash.

Animals which have apparently passed through the acute stages of the disease may remain unthrifty for a long time. Sometimes they die suddenly from disease of the heart, which is not an uncommon sequel of the disease. In other cases they present symptoms of lameness due to trouble in the joints.

The skin is discoloured by livid patches as in swine fever, but sometimes the only symptoms shown are those of nettle rash. The bacillus apparently can flourish for a long time outside the bodies of animals, so that once the disease is introduced into insanitary styes the infection tends to remain there. For some reason, however, which is ill understood, the disease may assume a very mild form for a time, then burst out acutely. In Great Britain the acute forms have been observed particularly in the warm months.

Post mortem.—The membranes of the stomach and intestines show red patches and are often swollen. The intestinal glands on the membrane are red and enlarged; sometimes the surface over these glands is abraded, but the distinct ulcer of swine fever is never seen. The lymphatic glands throughout the body are swollen and red. The spleen is often enlarged.

The membranous coverings of the lungs and hearts show red spots, and sometimes water is present in the chest and heart sac.

The lungs are congested.

In the chronic form the tissues around the opening between the chambers of the heart, particularly on the left side, are frequently thickened and rough—that is to say, endocarditis is present.

PREVENTION AND REMEDIES.

This is a disease against which several methods of protective inoculation have been directed. At the present day it is customary to employ either (1) a preventive serum obtained from horses which have been highly immunized by the injection of large quantities of pure cultures of the bacillus of swine erysipelas, or (2) a combination of specified doses of preventive serum and pure cultures of the bacillus.

The immunity conferred by the serum alone begins immediately, but it lasts for little more than ten days. Apparently, however, it exerts a protective action even when used in the initial stages of infection. The immunity conferred by inoculating with both serum and pure culture lasts a much longer time, probably six months and even longer. Leclainche, who has been foremost in elaborating this method of protective inoculation, advises that where the disease has already broken out, the pigs should receive a preliminary injection of serum, 10 to 20 c.c. according to weight. This, he states, greatly reduces the number of accidents consecutive to vaccination proper—that is to say, with the combination of pure culture and serum which is performed about ten days afterwards. The vaccination proper consists of two operations. The first is performed with a mixture (made on the spot) of serum—1 c.c. per 20 lb. live weight, with a minimum dose of 5 c.c. and a maximum of 10 c.c.—and ·8 c.c. of a pure culture. Twelve days later the second operation is performed, when the animal receives ·8 c.c. of a pure culture without any serum. The materials are injected subcutaneously, either at the base of the ears or inside the thighs, During a period of eighteen months ending November, 1901, Leclainche had under observation 24,000 pigs which had been inoculated by his method; about one-half of these were treated by a preliminary injection of serum alone. Not a single accident was recorded.

Lorenz has reported observations on 22,161 pigs which were inoculated in Eastern Prussia by the combined method (serum and culture), and 3,831 of these pigs were on farms on which the disease had already broken out. In the latter there were no fresh cases of swine erysipelas after inoculation; 50 per cent. of recoveries were recorded in sick animals after the injection of serum alone one to four doses). Nettle

rash, which is a mild form of swine erysipelas, occurred in ·04 per cent. of the inoculated animals. The disease disappeared from the farms after inoculation was adopted, whereas it had appeared at regular intervals before that time.

RECOMMENDATIONS.

(1) It is not advisable to resort to inoculation of pigs on non-infected premises unless the circumstances are such that owing to the proximity of acute outbreaks it appears practically impossible to prevent the disease being introduced by methods of rigorous isolation, because the operation might possibly be the means of infecting the premises.

(2) Should the disease appear, however, all the pigs should, with the least possible delay, receive a dose of serum, and those in which the temperature is normal should be removed to non-infected styes on the same premises, if this be practicable. Ten days afterwards the vaccination proper may be practised after the method of Leclainche (serum and virus, then virus alone) on those animals still showing a normal temperature. The pigs with high temperatures should be returned to the infected styes, and if their value warrants it, they should be treated by injections of serum alone. On no account should they receive the culture. If it be found impossible to separate the sick from the healthy, the operations should be carried on in the infected styes.

(3) Although this disease can to a large extent be successfully combated by inoculation, it must not be thought that measures of isolation and sanitation can be dispensed with. While the outbreak lasts no new pigs should be brought in, and none should leave the premises except for slaughter under the most rigorous precautions against the disease being conveyed to other premises. If a pig-owner finds that the disease reappears annually on his premises, he should resort annually to preventive inoculation, timing the operation so as to have his animals immunized before the season of greatest activity. He should also remember that the complete eradication of the disease from his premises will be greatly facilitated by keeping his pigs in styes which can be properly disinfected.

Although swine erysipelas can hardly be regarded as a very fatal disease of pigs, in Great Britain at least, the Board have been informed that it often interferes materially with the marketing of pigs, since it frequently attacks them and causes considerable emaciation close to the time when they are expected to be ready for market.

In such cases owners have been advised to immunize their pigs by methods of inoculation about three months before they are expecting them to be ready for market. From information received from those who have put this advice into practice, it would appear that the adoption of preventive inoculation has given excellent results.

As swine erysipelas is not a disease notification of which is required by Order of the Board, it should be borne in mind that a pig suffering from that disease may also be affected with swine fever, and that the Swine Fever Order of 1908 requires that every person having in his possession or under his charge a pig affected with, or suspected of, swine fever shall give notice to the police. In this connection attention is called to the "Notice to Pig Owners" issued by the Board.

ON THE EMPLOYMENT OF A THREE PER CENT. FORMALIN SOLUTION.

By Veterinary-Surgeon PAMPERIN.

In a riding horse several hard lumps as big as peas formed, lying thickly together in the saddle neighbourhood, and eventually developing into three nodes, each as big as half a pigeon's egg, I immediately tried to remove one of the lumps surgically. I found, however, that it was situated rather deeply in the subcutaneous connective tissue, so I desisted, and endeavoured to remove all three nodes with the above-mentioned solution. The well-known deep effect of formalin induced me to try it. After shaving the hair away in the neighbourhood of the lumps and over them, and disinfecting, I made two incisions at right angles down to the roots of the nodes and divided them into two halves. After cessation of hæmorrhage I dropped some of the solution into the incisions, and let the horse stand without being rugged. On the following day a few drops more were put in.

After the fourth day the divided knots began to loosen, and on the eighth day, up to which time a few drops daily had been introduced, I could remove the lumps piecemeal with the forceps. In the gaps left, which were carefully cleansed daily, I poured iodoform collodion and covered them with wadding. After further fourteen days the holes had closed up, and the horse was discharged cured.

I also used this means with good success on a dog with cartilaginous swelling, as big as a two-mark piece, on the right elbow-joint. I divided the swelling, poured in formalin solution, and bandaged the the place. Here also the knot could be taken away in pieces on the fourth day. The resulting wound was covered with iodoform collodion, and after twelve days' treatment a cure was effected.

No return of the swellings has been noted in either case, so a 3 per cent. formalin solution may be recommended.

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Clinical Articles.

FOREIGN BODY IN THE HEART OF A CALF.

By Wm. MOODIE, M.R.C.V.S.
Rothesay.

I AM sending you the photo of what is probably a unique case, showing the left ventricle of the heart opened, and embedded in the wall a piece of wire 2 in. long and hooked, the bent part being at the apex and ¾ in. in length. This was taken from a 7 weeks old calf in good condition, and my attention was called to it by Mr. Squair, butcher, who, on killing the calf and when disposing of the heart, in

Heart cut open, showing Wire in the Myocardium.

cutting it up, as shown, his knife was carried right alông the wire. There was no inflammation of the pericardium or endocardium, nor of the fleshy substance of the heart; externally and internally the mucous lining was perfectly healthy and natural, and the wire lay encased in a thin fibrous covering—as the butcher expressed it, like a meërshaum pipe in its case.

How and when did the wire get there? The calf did not swallow it; when did the cow, and how did it travel to the position shown in the photo? I leave your readers to speculate.

The calf never showed any signs of ill-health during life.

A CASE OF *POST-PARTUM* TETANUS IN A COW.

By NORMAN MEYERS, L.V.Sc.
Caulfield, Melbourne.

On Sunday, July 17, I received a telephone call to attend a cow, which, from the meagre message given, I presumed to be one of those varied cases associated with the act of parturition. On examining the animal, however, it took me but a short time to decide on it being a case of tetanus, and as such are comparatively rarely seen in bovines, the following clinical observations may be of interest:—

History.—The cow had calved some seven or eight days previously, and during the next twenty-four hours everything had appeared to be going on satisfactorily. From this period onwards, however, the animal evinced little inclination to take any food, and for the following few days the symptoms were those usually associated with "retention of the fœtal membranes."

Home remedies were given in the form of drenches, which were taken readily by the animal. On the Friday previous to my arrival the uterus was irrigated by means of the inevitable garden hose, with the result that a slight improvement was shown in the patient's condition. By Saturday afternoon the patient had again become worse, and through either lack of inclination or inability would partake of neither food nor water.

Symptoms.—The patient was standing in the corner of a small paddock, and on my approaching her showed signs of very marked timidity, which became visibly accentuated on handling. The head and neck were held in a rigid position, and at first sight this, perhaps, was the most marked feature of the case.

The picture when she moved was almost a grotesque one, for with stilty short steps forward she showed no liking to move either to the right or left, appearing all the time to be in danger of falling. When she did attempt to turn, the hind legs acted as a kind of pivot, on which the fore part of the animal was able to bring itself to the required position.

The masticating muscles were in a state of tonic contraction, so that prehension of food was impossible, and all my efforts to part the lower from the upper jaw were futile. Tenacious frothy material was adherent to the lips. The ears had lost their mobility, being held in a forward and outward direction. The eyes, though fixed and staring, showed no retraction, nor was there any protrusion of the membrana nictitans over the cornea. The neck muscles on palpa-

tion seemed as hard as a board, while those of the lumbar and abdominal regions were tense, so that a very "tucked up" appearance was presented. The vertebral column showed no alteration of curvature, and the tail, contrary to what is generally seen in horses, was hanging in the usual way.

The nostrils remained dilated, and although the respirations were short and shallow, yet they were louder and faster than normal, and increased to a marked extent on the slightest excitement.

Careful examination failed to locate any external wound whereby infection may have taken place, and although it is quite possible that it may have been associated with the act of parturition, yet the fact of no tetanic symptoms appearing until after the uterus had been irrigated inclines me to the belief that the garden hose was the germ carrier, while an abraded surface on the uterus caused by rough manipulation formed a favourable spot for the growth of the bacilli. Assuming this to be correct, the period of incubation of the tetanus bacillus in this case would be one of from twenty-four to thirty-six hours.

As the case was a particularly depressing one to the owner, and partly for economic reasons, no treatment was attempted.

A CASE OF SHOULDER LAMENESS.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College, Dublin.

Subject.—A nice looking, fat, roan pony, aged 4, by a trotting stallion out of an Iceland pony.

History.—Had been very lame on the near fore limb for twelve months, although doing no work and being well cared for.

Symptoms.—Those of severe shoulder lameness. When in the stable the animal was very uneasy on the limb, constantly shifting it. At a walk there was great difficulty in advancing the limb, and at a trot she went on three legs. When the shoulder joint was passively flexed great pain was evinced. The external tendon of the infra-spinatus, which passes over the internal tuberosity of the humerus, felt very hard, and when manipulated gave the sensation of a loose piece of bone, whose surfaces had become smooth, like a partial fracture of the tuberosity. After trying a blister without avail, I cut down on this tendon and found that there was no loose piece of bone. I removed a portion of the tendon at its insertion. Immediately afterwards the gait was greatly improved, and in the

course of the next few days the animal went almost perfectly sound, using the limb with great freedom, and standing well on it in the stable. But, after about a fortnight, when the wound was almost healed, she became lame again and eventually got as bad as before, having been at grass all the time. After some months the pony was brought to me again, and I now cut the fibres of the post spinatus where it seemed tense above the point where I did tenectomy, and this having no immediate good effect I line fired the shoulder joint. The pony was then sent to the country for the winter, and I did not see her until about eight months afterwards, when she was going almost sound, showing good action. It was a strange case of marked improvement after being extremely lame for about two years.

POLL EVIL.

By W. CARGILL PATRICK, F.R.C.V.S.

Mullingar, Ireland.

As the above condition has claimed a good deal of attention lately, amongst City practitioners in particular, I thought the following remarks and accompanying photographs might prove of some little interest:—

The subject was a light mare, aged 6, who had fallen under a load and got her head under the shaft during her struggles to regain the standing position. After being released she got up unaided, and was apparently all right beyond what seemed temporary bruising, yet was allowed a few days rest to get over any stiffness that remained.

Some time later, probably a few weeks at most, a swelling began to manifest itself at the seat of poll evil, as well as some difficulty in rotating the head. This was treated with cooling applications and a blister later; but as no improvement was noted, it was decided to operate, although no distinct fluctuation or pointing could be felt. Accordingly, the enlargement was cut into, and a fair amount of deep-seated pus given vent to, disclosing a new growth of bone at the base, in the form of osteophytes on the ala or wing of the atlas, but at that time we considered it did not extend to the neural canal, and consequently it was removed as well as possible, leaving only a roughened surface discernible on careful examination with the finger afterwards. The resulting wound was treated in the usual way, and the patient, making satisfactory progress, was sent home five weeks from date of operation with the wound looking quite healthy, and uninterrupted repair seemed assured. A week later we were asked to see the mare

Lateral view of Atlas in Mr. Patrick's Case of Poll-Evil.

Anterior view of Atlas in Mr. Patrick's Case of Poll-Evil.

again, as she had some difficulty in moving about her box, yet appeared healthy otherwise. However, on visiting the case, well-marked symptoms of inco-ordination were apparent, and a slight enlargement or fulness over right side of the atlas. As the pressure symptoms became more pronounced, in spite of physicking and deobstruent treatment, we concluded that the bony growths must be impinging upon the spinal cord and further treatment hopeless. She was therefore slaughtered.

On *post-mortem* examination we found the atlas had a large osteophyte on the right wing, and overhanging the neural canal to some extent. The right pedicle and wing were also much thickened, the articular surfaces or oblique processes of that side were slightly constricted from above to below, and a distinct gutter from the anterior foraminæ extending to the seat (or normal position) of the posterior foramen was present, the latter being entirely absent. The un-named oramen on the wing of the atlas was nearly four times larger than normal.

The changes present suggest the following queries: Was there any abnormality of bone present prior to the date of injury, and if not, what is the average period of time necessary for such pronounced changes to take place? This applies chiefly to the gutter, which evidently accommodated a blood-vessel, and to the obliteration of posterior foramen.

CASE OF FRACTURE OF THE FOURTH CERVICAL VERTEBRA.

By A. W. M. SWANSTON, M.R.C.V.S.

Captain, Army Veterinary Corps, Colchester.

Horse No. 12999, of 99th Battery, R.F.A., was admitted into hospital with reported "colic" on July 9 last. All symptoms of this passed off, however, after treatment, and the horse then appeared in a dazed condition. Soon after the animal was admitted it was reported that previous to the attack of colic it had reared up and fallen backwards on to its poll. When approached now by anybody it got very excited, reared up, and on the day of admittance it fell once on to its off-side.

The treatment consisted in keeping the horse very quiet in a loose box, and under constant observation; ordinary diet.

On July 10 no sign of colic was visible, but the horse appeared very uncomfortable, though it fed and drank well. It seemed rather

timid, however, and if anyone went into the box it invariably turned away towards a corner. There was no rise of temperature, and the pulse and respirations were barely altered.

On July 13 the horse was observed to have fits; it turned round and round in circles, always from right to left. On July 14 a very painful swelling was noticed on the right side of the neck. Up till now the horse had continued to feed and drink well; it ate everything in the shape of food that was given to it, and it drank quite a normal quantity of water.

About 11.30 p.m. on July 17 the orderly farrier came to my house and reported that the horse was down and "in a bad way," to use his his own words. On arrival at the sick lines I found the horse in much pain. I gave it 1 oz. of choral hydrate, and made it as comfortable as possible with bedding in sacks. The next morning the horse was up, and as the effects of the choral worked off it took its food and water during the day. It had one fit about noon, and two more during the afternoon and evening.

On July 19 the horse had several fits during the day, always turning in the same direction—*i.e.*, from right to left. The horse appeared to get its neck twisted to the left, and was not able to get it back again, but when it did succeed in doing so, the fit passed off.

On July 20 at early morning stables the horse was found to be lying down. It gradually lost consciousness, but death did not actually take place until after 2 p.m. on Friday, July 21.

Post-mortem examination showed fracture of the left transverse process (throughout its whole length), and the posterior division of the right process of the fourth cervical vertebra.

This case is of interest inasmuch as the horse lived from July 9 till July 21.

"AN OBSCURE CASE." WANTED—A DIAGNOSIS!

BY AUG. LEANING, M.R.C.V.S.

Captain, Army Veterinary Corps, Woolwich.

A REMOUNT was awaiting discharge from the sick lines, after being affected with catarrh for twenty-six days. The horse had had two inoculations with Rotterdam anti-strangles serum. The history of the case is as follows:—

The horse was reported off-feed; temperature 105° F.; respirations not hurried; pulse fairly strong; and no sign of catarrh. The following day the temperature was 104·2° F., and there was no catarrh

during the morning. At midday there was a profuse discharge from both nostrils. This was mixed with blood, and a thick ropy material as if the Schneiderian membrane was sloughing away. Later in the day the breathing was stertorous, discharge thicker, and the nasal chambers nearly blocked. At 7 p.m., as the horse was getting so distressed and there appeared every probability of suffocation, tracheotomy was performed. The horse was much easier afterwards and fed a little, but death occurred a few hours later.

Post-mortem Examination.—The epiglottis and glottis were very congested. Turbinated bones on both sides were full of blood clots, giving them an appearance almost like liver. They were quite close together, and occluded the air passage. The mucous membrane had sloughed away. The bones appeared to be more of a cartilaginous than bony nature. On section they were of a dark red colour, and had the appearance of liver in an advanced state of cirrhosis. The Schneiderian membrane was of a dark red colour. The alae of both nostrils were considerably thickened and congested. The trachea was normal. Both lungs were in a state of acute pulmonary congestion, and contained numerous hæmorrhagic areas. The right lung had a wedge-shaped infarct extending from the surface inwards for two inches. Heart: The myocardium was inflamed and showed numerous ecchymoses in both ventricles. There were numerous adhesions between the liver and diaphragm, the remains of an old-standing perihepatitis.

CASE OF SEPARATION OF EPIDIDYMIS FROM TESTICLE.

By W. STAPLEY, M.D., M.R.C.V.S.

Professor of Surgery in the Veterinary School of the University of Melbourne, Australia.

Being asked to place on record a bungling operation I did on a horse with a hidden testicle, I do so to prevent further mistakes of a similar nature.

A four-year-old horse had been castrated on the right side. The left testicle could not be found by the castrator.

Bimanual examination was negative. Incision over the external ring at once brought to light a mass beneath the cremaster, which appeared as a fully-developed epididymis and a greatly atrophied testicle. It was removed. The mass was submitted to an expert histologist, who by frozen section said it was undeveloped testicle, but

he asked for time to prepare a proper section. After a delay of ten days, no report being received from the histologist, I prepared to send the animal home—some 150 miles distant. Luckily the animal charged a stable boy, got loose, careered through the heart of Melbourne, and was astray at the time he was booked as a passenger on a steamboat. That night the histologist reported "the tissue is certainly epididymis, and not testicle." On recovery of the animal I again operated, and removed a large flabby testicle that was free in the belly, hanging by a long mesentery from the loin.

The case is recorded because of the wide separation of tissues normally associated. An investigation of fœtal horses reveals at once the possibility of such a wide separation, and some marsupials, such as the opossum, show normally a separation of testicle from epididymis. As far as I can ascertain, there is no record in human surgery of a similar separation of testicle from epididymis in man. I believe this condition in the horse has been previously reported; it is, however, such an important surgical condition that I felt a brief record of this case may serve to keep our memories clear on the fact that such separations occur, and should be looked for when operating on monorchid or on cryptorchid cases.

FATAL INTERNAL HÆMORRHAGE AFTER CASTRATION OF A RIG.

By J. J. O'CONNOR, M.R.C.V.S.

Professor in the Royal Veterinary College, Dublin.

OUT of a large number of rigs that I have operated upon, I had the good fortune not to lose one until recently, when I lost one from internal hæmorrhage.

Subject.—A strong cart horse, aged 3, in very good but soft condition.

Operation.—Cast and chloroformed, fixed in the dorsal position, took the usual precautions, removed the large testicle which was in the left scrotum by torsion, no bleeding resulting from the end of the cord; explored the right inguinal canal, found there the vas deferens in a fibrous sheath, opened the sheath and tried to draw out the testicle through this opening but failed, even after dilating it somewhat by means of a long forceps. I then made an opening through the anterior wall of the inguinal canal, higher and further outwards than the internal inguinal ring, by means of a blunt perforator, inserted my two fingers into the opening and found the

testicle, which was fairly large, hard, and fibrous, drew the testicle out, and severed the artery and vas deferens, together with the ecraseur, the proximal end of the cord falling backwards into the canal and probably into the abdominal cavity; plugged the canal with sterilized gauze kept in by sutures, dusted the wounds and their vicinity with iodoform, and let the horse up.

There was no suspicion from the appearance of the wounds of hæmorrhage taking place. In the evening after the operation the horse took his food well, but his pulse was weaker than normal, and there was a good deal of dark blood dripping from the wound on the normal side. The slight bleeding was easily arrested by inserting a plug of sterilized wool into the scrotum. There was not a trace of blood from the other side. The next morning the horse took his feed, but his pulse was weaker, being difficult to count, but never exceeded 60 in frequency. The temperature was 104° F. I was surprised that there was practically no heat or swelling in the vicinity of the wounds: on the contrary, the sheath and scrotum seemed flabby and coldish. The mucous membranes were not pale, but seemed somewhat cyanosed. The respirations were not accelerated. Soft fæces and urine were freely passed, and there was no evidence of abdominal pain. He took his mash at night. The next morning, the second day after the operation, the horse was blowing hard, and had a very weak pulse and a temperature of 104. The penis hung limp and cold from the sheath, and the extremities were cold. Later he sweated and trembled, and died at 11 p.m., about fifty-six hours after the operation.

Post-mortem examination revealed the abdominal cavity almost full of blood. There was nothing about the cords to indicate that hæmorrhage had occurred from them. We came to the conclusion, without positive proof and without looking out for other bleeding vessels, that bleeding occurred from the end of the retained cord which was severed by the ecraseur, after its return to the abdominal cavity, and that bleeding could not show in the inguinal canal owing to its being well plugged. There was no trace of peritonitis. I have always used the ecraseur for retained testicles, and never had bleeding before. This carcase also rapidly became emphysematous throughout the body. The testicle was hard and fibrous, and contained a dermoid cyst.

MUCO-ENTERITIS FOLLOWED BY MULTIPLE ABSCESSES IN THE SPLEEN, AND PERITONITIS, COMPLICATED WITH HEPATIC CIRRHOSIS AND THROMBOSIS OF THE BRANCHES OF THE PORTAL VEIN IN A RACEHORSE.

By J. A. GILRUTH, D.V.Sc., M.R.C.V.S., F.R.S.E.
Professor of Veterinary Pathology, University of Melbourne.

This interesting case was brought under my observation by Mr. E. F. J. Bordeaux, B. ès L., G.M.V.C., Melbourne, in whose care the animal was during the whole course of the illness.

The case is almost unique in many respects, and I was glad to have an opportunity on several occasions to see it, and especially of making a *post-mortem* examination along with Mr. Bordeaux. The onset of the disease, the intermittent colicky symptoms, the progressive weakness, the irregularity of the temperature, and during the later stages of the illness the appearance of jaundice are specially interesting features. From observations of the case I am convinced that death would have occurred at a much earlier date but for the special attention given by Mr. Bordeaux and the careful nursing of the owner.

The following is Mr. Bordeaux's short account of the symptoms and treatment of the case :—

"*Subject.*—Bay thoroughbred horse, aged 4.

"Brought to hospital on November 24, suffering from colic with usual symptoms but no violent struggling. Temperature and pulse normal; contents of rectum slightly mucus-coated, peristalsis slow. I wanted to administer linseed oil but was asked by the owner not to do so as this horse was engaged in a race on December 1, so I gave him arecoline $\frac{3}{4}$ gr. and a ball of nux. vom. and ammon. carb. Enemata were to be given until pain ceased. This horse won the race on December 1, and appeared in perfect health on that day. I advised the owner to put him on a light diet of mashes and green food for a few days, but my instructions were not carried out, the horse being fed and worked as usual.

On December 3, immediately after work, colic symptoms reappeared. The contents of the rectum were mucus-coated; temperature 104° F. Diagnosis, subacute enteritis. I administered Ol. lini. spt. ether nit., and spt. ammon. co. For the next three days the temperature varied from 103° to 101° F. but there was no sign of intestinal pain and the appetite was good; diet consisting of mashes, green food and a little oaten hay.

"On December 6, petechial spots appeared on the membrana nictitans. Slight intestinal pain was exhibited about two hours after each meal (which I considered was probably due to some ulceration of the mucosa of the large colon) and this continued for a week, although the diet consisted only of mashes and green food. Treatment, nux. vom., quinine and gentian. The temperature remained between 102° and 103° F., and the general condition did not alter much until the 13th, when the intestinal pain became acute. The contents of the rectum were thickly coated with mucus and large hæmorrhagic spots appeared on the visible membranes. I administered ol. lini. with spt. ether nit. and spt. ammon. co., after which the the intestinal pain disappeared, and prescribed the following treatment. One pint of cod liver oil and 1 pint of milk morning and evening as a drench, which the horse took without trouble. Nux. vom. and potass. iodid. at mid-day. This treatment was adopted as the diagnosis was then muco-enteritis of the large intestine with ulceration. The appetite was still good, green food only being given. Colicky pains did not reappear.

"On the 18th the temperature was 105° F., pulse 52. The former treatment was continued in addition to which the bowel was flushed twice a day with warm soap and water and ½ oz. of liq. arsenical, given every evening in a handful of damp bran. The temperature varied from 103° to 104° F. for the next few days, the pulse was weaker and more frequent (72), and the horse was getting very thin.

"On the 25th, the membranes had become icteric., and there was extreme weakness, but the appetite was still good. The legs were becoming œdematous, as the horse was now afraid to lie down.

On the 27th, the temperature was 106° F., pulse 80, and general condition very grave. The general condition got worse every day, the temperature remaining high, 106° F. until the 31st, when it suddenly fell and the horse dropped dead at noon."

Post-mortem examination was made at the "Knacker's" about four hours after death. The following are the notes. Body emaciated. Subcutaneous tissues yellow and showing areas of hæmorrhage, particularly about the limbs. Peritoneal cavity contains about 2 gallons of yellowish granular fluid with numerous flocculi. Fibrinous adhesions between anterior flexure of floating colon and spleen. Parietal surface of peritoneum congested and studded with small inflammatory papillæ. Omenta swollen congested and œdematous. Stomach, mucosa congested; several tumours due to *Spiroptera megastoma* present (a common condition in Victorian horses). Small intes-

tines and great colon normal. Floating colon at anterior flexure shows several small patches of old submucous hæmorrhage and several circular and oval depressions, livid in colour, being apparently healed ulcerations. Spleen enormously enlarged, weight 37 lb. Enlargement is chiefly due to a large swelling about twice the size of a football, implicating practically the whole of the organ with the exception of a small area at each extremity. On section this swelling is found to consist of a large central mass of semi-fluid, granular, greyish material, surrounded by numerous purulent foci varying in size from a wheat grain to a pea scattered irregularly amongst a dark, almost black, and softened spleen pulp. Liver, enlarged, weight 35 lb.; consistence comparatively soft and friable. On section the majority of the branches of the portal vein are seen to contain long yellow-coloured dense thrombi varying in diameter from that of a thread to that of a pencil. (Unfortunately the vein was not carefully examined before removal so that the condition could not be observed definitely to exist external to the liver.) The thrombi appear at places distinctly adherent to the wall of the vessel, at others lying free. Hepatic lobules swollen and distinct and apparently surrounded by a fine peripheral greenish band which on careful examination gives the organ a reticulated appearance. Kidneys pale and swollen. Pleural cavity contains about a quart of sero-sanguineous effusion. Lungs normal but for one or two emphysematous areas. Pericardium contains about 6 oz. of sero-sanguineous effusion. Underneath the epicardium of the auricles and at the cardiac grooves are large patches of blood extravasation with gelatinous exudate, but otherwise organ normal.

Microscopical examination of smears showed as follows: Peritoneal fluid, spleen pulp and pus, many leucocytes, chiefly polymorphs, with short chains of streptococci and numbers of short cocco-bacilli, gram negative. The central broken-down material in the spleen contained chiefly streptococci and large diplococci; the blood diplococci and cocco-bacilli; the surface of the liver thrombi streptococci, short bacilli, and some large bacilli probably putrefactive; but in the centre of the thrombi no organisms could be demonstrated. Pure cultures of both organisms were secured; the cocco-bacillus exhibiting all the characters of the pasteurella group; the streptococcus having no special characters, being similar to that usually found in purulent affections of the horse.

Microscopical examination of liver sections shows a condition of interlobular cirrhosis of some standing. The new fibrous tissue

implicates chiefly Glisson's capsule, but is found often invading the lobules, causing atrophy and distorsion of the liver cells. New bile ducts (so termed) are frequent. The bile ducts and branches of the portal vein are implicated in the inflammatory proliferative process and it is most probable that the thrombosed condition of the portal vein branches, observed microscopically, is due to extension of this through the vessel wall to the intima. The thrombus in each small portal branch is almost invariably attached to the intima but at only one area of the periphery, the remainder being free. In the space between the free surface of the thrombus and the intima of the vessel normal blood cells are usually found indicating that some circulation was being maintained during life throughout the liver. Catarrh of the bile ducts is absent. The hepatic cells are loaded with greenish pigment as is so often the case in hepatic cirrhosis of the horse.

The thrombi show no evidence of streptococci or other organisms and none can be detected in the liver substance proper.

Conclusions.—The pathology of the case is extremely interesting. The *post-mortem* picture was complicated, and taken together with the clinical history of the case, the correct reading would seem to be as follows:—

The animal was primarily from the clinical point of view affected with a sub-acute muco-enteritis of the colon; the cause being probably the pasteurella of influenza (a common equine affection in Melbourne), Streptococcic invasion followed as so often happens and extended direct by contiguity, to the spleen and the peritoneum. So far as these regions are concerned the explanation suffices, but the liver lesions remain unaccounted for. At first one is tempted to conclude that the hepatic thrombi and cirrhosis were due to further extension of the streptococcic infection, but the absence of streptococci in the liver substance and especially within the thrombi negative this. It is more probable the hepatic lesions were independent, due to some toxic agent in the fodder to which the thrombus was secondary. We are aware that the plants of the *Senecio* family will gradually produce a definite hepatic cirrhosis in horses, cattle and sheep (as was first experimentally demonstrated by me—see Department of Agriculture, New Zealand Reports, 1902), and subsequently by others in Canada, South Africa, &c. In this particular case no evidence of *Senecio*-contaminated fodder was forthcoming, but seeing that *Senecio jacobæa* (Ragwort) is fairly common in certain agricultural districts of Victoria, and that this horse had been stable-fed for two years on market-purchased fodder, the possibilities of such a cause having been in

operation must not be overlooked. Further, it has not been satisfactorily shown that bacterial infection can produce such a general cirrhosis as presented by this case. On the contrary, my experience is that a horse may present no symptoms whatever of illness, although the liver be in an advanced stage of cirrhosis, provided the alimentary canal remains normal, but that the slightest digestive derangement is followed by severe, and generally fatal results, possibly due to the inability of the liver to cope with and neutralize the intestinal toxins.

Canine Clinical Notes.

TORSION OF THE STOMACH IN A DOG.

By JOHN L. PERRY, M.R.C.V.S.

Cardiff.

A VALUABLE bloodhound was brought to me at 2 a.m. on August 26, the owner's message being that he thought the dog had "picked up poison." The history was that the dog had been taken out for exercise the previous evening, and returned home apparently healthy. When fed with melox and paunch, cut up, at 11 p.m., he was noticed to eat a little, then walk round his kennel and return to his food, again eat a little, then repeat the performance. Soon afterwards he commenced to paw his bedding about and moan frequently. This continuing for some time, the owner administered an emetic of salt and water, which was swallowed all right. Soon afterwards there were constant attempts to vomit, dribbling of saliva, swelling of abdomen (tympany), and noisy eructations of gas.

All these were in evidence when brought to me at 2 a.m. the following morning, the dog being extremely restless and in acute pain.

The abdomen was quite hard and tense, and manipulation increased the pain. I gave him 1¾ gr. of morphia subcutaneously and a full dose of sod. hyposulph. *per os.* In half an hour's time the tympany was considerably less and the pain diminished. Although neither vomition or defæcation had taken place, the soporific effects of the morphia were pronounced, and advantage was thus taken to secure the dog on the operating table and pass the probang. Some obstruction was encountered at the stomach end of the œsophagus, but no opinion could be formed as to its nature; it could not be complete blocking, as swallowing could take place, although it increased the retching.

The dog remained under the influence of the morphia for four hours. After that small doses of sod. hyposulph. and chlorodyne were administered, the patient lying fairly comfortable, except for an occasional twinge of pain, until 10 a.m., when the tympany and pain got worse. A fine trochar was then inserted into the stomach on the left side, and some gases evacuated followed by a little fluid. This gave only temporary relief, and the dog died at mid-day.

A *post-mortem* examination was immediately made, and revealed the stomach twisted on its superior attachments—from left to right—a half turn. The whole organ was very dark, almost claret colour, and engorged with blood, owing to vascular compression. The contents were about a pint in capacity—equal parts liquid and solid; amongst the latter were found pieces of paunch. After adjusting the organ to its normal position, the hole made by the trochar was sought and found on its right side.

I cannot find any mention of torsion of the stomach in any English volume, but I am told that Cadiac, in his "Encyclopædia Vétérinaire," says the condition is not uncommon, and that he saw three cases in one year. He says the anatomy of the organ permits free torsion from left to right, especially when the organ is empty.

Of course, no treatment can be of any avail in such cases, excepting some surgical interference, such as a laparotomy performed in the early stages.

AN INTERESTING CASE OF NETTLE-RASH IN A DOG.

By E. RAITSILS.

When walking in the street a six months old pointer suddenly and unexpectedly developed a severe œdematous swelling of the whole head, and of the œsophagus, together with the upper part of the under surface of the neck. The swelling was diffuse, not very hot, not sensible to pressure, and felt doughy. In addition, on the skin of the sides of the neck and anterior extremities there were round elevations of the skin, from the size of a lentil to a horse bean. After a dose of salts and friction with spirituous lotion the swellings had completely disappeared on the following day. As the dog consumed different kinds of vegetables daily, it appears not unlikely that the rash was due to some plant material. The author has noticed a similar case in a fox-terrier that had an attack of nettle-rash regularly after eating strawberries or chocolate.

(*Deutsche Tierärztliche Wochenschrift.*)

Abstract.

THE RELATION OF PURE SCIENCE TO PRACTICE, WITH SPECIAL REFERENCE TO THE PHENOMENA OF PARASITISM AND INHERITANCE.[1]

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In my student days it was customary to devote a considerable portion of an introductory address to the delivery of a homily upon the correct conduct of youth. In Shakespeare's words we were bidden—

> To live and study here three years.
> But there are other strict observances:
> As, not to see a woman in that term;
> And, one day in the week to touch no food;
> And, but one meal on every day besides;
> And then, to sleep but three hours in the night,
> And not be seen to wink of all the day.

It is not my intention, however, to take up your time in this fashion; were I to attempt to do so, your answer to such would doubtless be the same as that of Birón to the exhortion just quoted—namely :—

> O, these are barren tasks, too hard to keep;
> Not to see ladies—study—fast--not sleep.

Nevertheless, without unlocking a stream of moral platitudes, I would wish, on behalf of my colleagues and myself, to offer sincere congratulation to the prize winners, may they "go on and prosper," and to those now entering upon their college career we extend a sincere welcome. I hope you will soon feel at home, and that you will from the first take a real interest in all the activities of your College life, its sport, and its societies.

The true value of a collegiate life is derived from the judicious combination of the intellectual and social sides. The one fits you for your professional career, the other (and it is of scarcely less importance) teaches a man "to aid and bear a part in all actions and occasions." It should, moreover, be the period of life for making friendships, for "Whosoever is delighted in solitude, is either a wild beast or a god," to quote the words of Aristotle. I *know* you are not wild beasts. I *presume* you are not gods. Friendships are, therefore, very necessary, for "if a man have not a friend he may quit the stage."

I would, therefore, urge upon all who are now joining to take an active, but not a too engrossing, share in the college games. Cultivate *esprit de corps*. The success of the collegiate life in the older universities is largely due to this spirit. It is what we of the London Colleges, more particularly those colleges constituting the University of London, and among the number of which I hope this College will very shortly be included, require more and more, and which we ought to do all in our power to foster. A healthy spirit is just as necessary

[1] Introductory address at the opening of the session of the Royal Veterinary College, London.

for the life of an institution as of an individual. It is, however, to other subjects that I wish to draw your attention for a short time to-day.

Not being a member of your profession, it would be an impertinence on my part were I to attempt to address you upon a subject immediately concerned with veterinary practice or politics. I have therefore selected a more general topic, and one upon which I feel myself somewhat more competent to speak, the relation of so-called "pure science" to practice with special reference to the phenomena of parasitism and inheritance, and incidentally the place and importance of biology in a medical curriculum. I may say in passing that in using the terms "medicine" and "medical" I refer to both human and veterinary, for the problems in both cases are similar, and I believe the educational aims to be identical.

It is often asked by the student and by the "practical" man, What is the use of biology in the medical curriculum? Why should the student be required to waste time over the anatomy and physiology of animals, for which he will never be required to prescribe, or at whose confinements he will never be called in to assist? Such questions are not altogether unnatural from a student in his first year, since he cannot be expected to realize the full import of the subject. The more serious objector is the fully-qualified man, the post-graduate, whose proud boast is that he is nothing if not practical, and who is ever insisting on the fact that medicine is a practical subject. It is to such an one that I would address my remarks, and attempt to show that, while not underrating in the very least the value of the practical applications of science, nevertheless it is to the pure biologist (using the term in its widest sense) that nearly all the more important advances in biological knowledge are due, to prove in fact what the President of the British Association so recently said at Sheffield, that the modern Universities have to prove "that abstract thought is not antagonistic to practical work, or scientific research to the labour of the factory or foundry," and, may I add, "or practical medicine." "The one and the other can harmoniously co-operate in the advance of knowledge and the progress of civilization."

The pure science man works at his subject with the sole object of acquiring and extending knowledge, of investigating the laws of Nature without any particular thought of practical applications. This is beyond doubt the highest aim. Unfortunately, among such there is sometimes a tendency to belittle the practical side; indeed, some extremists appear almost to go so far as to think that if a subject can be shown to have an economic or utilitarian aspect it ceases to be, if not scientific, at least to be of less interest. In my opinion such views are unfortunate, and such men lay themselves open to the stigma of being regarded as visionaries, or even "cranks," with but little knowledge of the world. On the other hand, the purely practical man is often a man of equally limited outlook, too apt to gauge every scientific fact by the sole standard of utility, and the utility is but too often estimated by the monetary value derivable from the application of the scientific facts. For, if we analyse this modern cult of the practical, I think one is bound to admit that the main underlying considerations are but too often mercenary.

While fully realizing that the majority of students are destined

to become practitioners, earning their livelihood by the practical application of scientific facts, I am afraid there is a danger of bending the knee too much and too often to the Baal of practical utility. We require, I think, to realize more fully than is often done that the "pure scientist" and the "practical man" are both equally necessary, that one is the corollary of the other, and in this faith I would urge that medical education should be as broad as possible, and not regulated entirely by motives of immediate utility. The student, while his mind is in a receptive state, untrammelled by the cares of income-earning, should be taught the more theoretical aspects of science, upon which his future practice should be based; his mental outlook will thereby be broadened, and I venture to think that the student who has been trained in general principles and scientific methods will, in nine cases out of ten, turn out to be the better practitioner.

Faraday, the results of whose researches have had such far-reaching effects, was one day asked by a lady in a somewhat depreciatory tone what was the use of his researches? His simple but pregnant reply was, "Madam, what is the use of a baby?" I think it may fairly be stated, at any rate of the biological sciences, that all the most valuable practical results have been the outcome of researches which in the first instance, and taken by themselves, appeared to have no value beyond that of scientific interest.

Who, for example, would have imagined at the time that the simple experiment of Van Helmont would prove to be the starting point of such important and far-reaching results? Van Helmont planted a willow tree of known weight in a tub of dry soil also of known weight. After a period of five years both were again weighed, and from the resulting differences certain deductions were drawn as to the transformation of water into the material of the tree. This apparently useless experiment in reality was a basis upon which, as Mr. A. D. Hall has recently pointed out, the super-structure of modern and rapidly extending science of agriculture has been erected.

Again, turn to the academic researches of Pasteur upon the growth and nutrition of the yeast plant, his work in connection with fermentation, and perhaps more than anything else his researches, commenced in 1865, into the causation and prevention of silkworm disease, and note how they paved the way for the dominating germ theory of disease. To quote the words of the distinguished American Protozoologist Calkins [2], it is of no importance that the characteristic black spots of pébrine were not recognized by Pasteur "as the spores of a protozoon, but the important results which followed their discovery, and which led to increased length of human life and to the mitigation of human and of animal suffering throughout the civilized world, would make an increasingly substantial monument to the patience, courage, and virility of this man of pure science, who, by the apotheosis of scientific method, proved these unknown corpuscles to be the cause of this silkworm disease."

The controversies over the cell-theory and the bitter controversy over the theory of spontaneous generation brought the knowledge of the protozoa, both parasitic and free-living, prominently before the biological world, but not till nearly a quarter of a century later did the protozoal origin of disease find any acceptance, and it is only within the past few years that these ideas have become unshakably

established. Though the researches of Pasteur did so much to stimulate the study of micro-organisms, members of the two great groups of pathogenic protozoa, the hæmoflagellates (to which the trypanosomes belong) and the sporozoa were known before Pasteur's work on the silk-worm disease. The first trypanosome appears to have been discovered by Valentin in 1841 in the blood of the trout. Very shortly afterwards Remak and Berg noted their presence in other fishes; then followed the discovery of these organisms in the blood of frogs, birds and rats. The first trypanosomes met with in disease was by Griffith Evans in 1880 who found them in horses suffering from Surra in India. Then came Schaudinn's classical work on the *Trypanosoma noctuæ* of the little owl, and Bruce's brilliant researches in 1895 when he discovered the parasite of nagana, the tsetse-fly disease, in the blood of infected horses and cattle, and the important part played by the fly in transmitting the parasite.

With the more recent work on sleeping-sickness and Malta fever you are all familiar.

So too, with the sporozoa, undoubted Gregarines were noted in invertebrate animals before the close of the eighteenth century, and as early as 1839 Hake published investigations upon the spores of the coccidium of the rabbit. In 1841 Johannes Müller described many new forms in fishes. These led on to other researches which culminated in the discovery in 1880 of the malaria parasite by Laveran.

Koch regards the discoveries of Bruce and of Laveran, together with that of the parasite of Texas-fever in cattle in 1893 by Smith and Kilborne, as the three great landmarks in the history of our knowledge of the pathogenic protozoa, each of which opened up new and wide fields of fresh investigation, until now as Professor Minchin [7] has said "So great is the interest which these parasites excite at the present time, on account of their pathogenic properties in man and beast, that now scarcely a month passes without the publication of some discovery relating to them, and the study of the protozoa bids fair to assume in the near future a position of importance scarcely secondary to that held by the science of bacteriology."

Thus we see that the early discovery of these important organisms was due to the labours of men of pure science, who found them in the lower vertebrates and in some invertebrates, and that they, unimportant as they appeared to be in themselves, formed the basis of the later work which has been of such incalculable benefit. Indeed, it is safe to say that bacteriology and the whole principle of antisepsis and asepsis as well as of protozoology take root in the classical researches of such men as Pasteur. The discovery of the causation of these protozoal diseases has led on to their prevention and treatment. Nuttall's discovery of a cure for piroplasmosis is of the utmost importance and the reduction of animal mortality likely to ensue will lead to the saving of thousands of pounds annually. Is it too much to expect that the active researches now being prosecuted all over the world into the causation of cancer, to which the cytological researches of Farmer and Moore gave such an impetus, may before long lead to similar practical results?

Turning now to the metazoan parasites. The more systematic study of their effects upon the blood of the host has yet hardly been

entered upon or its importance so generally appreciated. The life-histories of some of the commoner cestode and nematode worms have been known to us for several years, and for a great deal of this knowledge we are indebted to our own countryman Cobbold, and a former distinguished lecturer in parasitology at this College, but there is yet much to be done. The brilliant and patient researches of Loos [7] extending over many years and from which he came so near to sacrificing his own life have shown conclusively that the larvæ of *Ankylostomum duodenale* can penetrate directly through the human skin and that of puppies when brought into contact with water containing the larvæ. In Neumann's "Animal Parasites" [10] it is stated that "Humidity has at all times been considered as one of the most predisposing causes to the invasion of the economy by worms. Rainy years are marked by the extension of various forms of helminthiasis in animals which graze; and these affections are more marked among animals that frequent inundated pastures and swampy places, and the borders of lakes and ponds." This is explained by the ova being preserved in water and being taken in when drinking. May there not be a possibility, at any rate in some cases, of a direct infection through the skin such as Loos has shown to be the case in the miner's worm. If such a possibility should turn out to be correct, then mere attention to the drinking water would be of no avail, the animals should not be allowed to frequent "swampy places or the borders of lakes and ponds." It seems to me that such a question would be worth while investigating.

It may be said that the presence of intestinal worms is on the whole of comparatively little moment since so many animals are infected with so little proportionate disturbance of the economy. Krabbe states that 67 per cent. of all dogs have intestinal entozoa. This objection may be true to some extent as regards certain entozoa being the direct and immediate cause of serious symptoms, but there is no doubt that they may act as the indirect and predisposing causes of much more serious affections. Their mode of attachment to the intestinal wall causes a lesion through which bacteria or other organisms may gain admission to the blood and lymph. This point has been insisted upon by Dr. Shipley [9] who considers that many cases of appendicitis in the human subject associated with the presence of parasitic worms in the intestines and in the appendix itself, are to be explained in this manner. Further, evidence in the same direction seems to be forthcoming in the findings of the commission into the causation of grouse diseases.

But I do not think we are even here at the root of the matter; there is, I believe, in many cases something more. The parasite is not in all cases the mere mechanical agent so to speak, preparing the way for the entrance of other organisms to perform their deadly work. The convulsions, the spasmodic movements, and all the other nervous symptoms to which infected animals are liable are usually ascribed to irritation of the nerve ending, that is to say to mechanical causes. There is reason to believe that the parasite in itself is injurious.

I wish to draw your attention to some recent interesting and remarkable facts concerning parasitism in the crustacea. It is well known that certain crabs are liable to be infected by another parasitic crustacean. The male crab-host is easily recognizable from the

female by certain well-marked differences in the secondary sexual characters, differences in the appendages, in the breadth of the tail, and in other respects. The parasite commences life as a free-swimming form but ultimately becomes attached to the abdominal appendages of its host and there undergoes degeneration, becoming in time converted into a globular mass, without definite organs, and from which spring long processes penetrating into the tissues and organs of the host. The effects of this parasite upon its *male* crustacean host are most remarkable; the secondary sexual characters are transformed into those of the female, so that the infected males have been constantly mistaken for females.

In addition to this Giard [5], Geoffrey Smith [11], and Potts [8], have shown that the effect of the parasite is to cause dwindling and ultimately an entire disappearance of the genital glands, and on account of this effect Giard gave the name "Castration parasitaire." Infected females show very little modification of the external characters, but the ovary is reduced or obliterated. The still more remarkable observation has been made that the completely modified males may occasionally recover from the parasitic infection and regenerate the genital gland, in which case they become perfect hermaphrodites, the gonads producing both ova and spermatozoa. Comparable phenomena are now known to occur in nearly all classes of invertebrate animals, though the alteration of the secondary sex characters is not so marked a feature as in the crustacea.

In Mozambique there is, according to Turner [12], a very prevalent idea that impotence and sterility accompany bilharziosis but I know of no definite proof of the interference with fertility among vertebrate animals due to parasitic infection. Nevertheless, I think it is a point worth bearing in mind as it might be of some practical importance in relation to the value of infected animals for breeding purposes.

What these researches do show is that the parasite has a very marked effect upon the metabolism of the host. How that effect is brought about, whether through the action of a secretion into the body of the host, or whether by some interference with the normal hormones of the host, as has been suggested, it is as yet quite impossible to say. I would suggest that a useful line of work in the first instance would be to make an extract of the crustacean parasite and inject it into normal uninfected males and see whether effects similar to those caused by the parasite itself can be produced, and thus to determine the point as to whether or not the effects are caused by a secretion from the parasite.

I would note in passing that the parasites known at present to cause deterioration of the genital glands are those found in the body cavity or in the blood spaces and not the gastro-intestinal parasites, but that these latter have in some cases a marked effect upon the blood of the host has been amply demonstrated. A good deal of research has been devoted to the changes produced in the human blood by various endo- and ecto-parasites, some of the more important results of which I may briefly mention.

Of the Cestoda, *Tænia solium* and *T. saginata* have but little effect and that of a transitory nature, the effect being limited to the Eosinophiles, but in the Cysticercus stage there is marked eosinophilia. On

the other hand the results of infection by *Dibothriocephalus latus* are of a much more serious nature. In the blood of Tænia-infected persons the leucocytes, as I have just said, only are affected, whereas in Dibothriocephalus infection the effect is almost entirely confined to the red cells, in many cases giving rise to so profound an anæmia that it is only distinguishable from true pernicious anæmia by the fact that the patient recovers on expulsion of the worm. The character of the blood in these cases is "a marked oligocythæmia, a high colour index, the presence of nucleated red cells of the megaloblastic type, the appearance of deformed red poikilocytes and cells showing polychromatophilic staining" [4].

Hydatid disease due to the cysts of echinococcus gives rise to a general and serious leucocytosis.

Of the nematodes, cases of infection by the common *Ascaris lumbricoides* are reported in which, in addition to an eosinophilia, the red blood-cells have been reduced to half the normal number.

The very marked anæmia of Egyptian chlorosis due to infection by *strongyloides intestinalis* is well known to everyone.

It is not necessary to multiply examples, but the point upon which I wish to insist is that when one takes into account all the facts of parasitic infection, we are forced to the conclusion that the parasite generates some poison which affects the host to a greater or less extent, and that the leucocytosis is probably a protective effort on the part of the host. The anæmia is to be regarded as a result of infection and not merely a predisposing cause, as stated in some of the text-books; and, further, that this anæmia is due to some toxic influence from the parasite. I suppose that it is possible that immunity to those effects can be established, and for that reason the frequent infection of dogs does not give rise to more serious symptoms than it does, though, as we have seen, the cestodes even in man give rise to but slight changes in the blood.

Is it not probable that not only the anæmia, but all the other symptoms of helminthiasis—the convulsions, epilepsy, vomiting, &c.—are all due to this toxic affection?

There is a sentence in Neumann's book which seems to me to point out a line for further researches. He writes: "There are symptomatic manifestations that properly belong to each kind of domesticated animal and to each species of parasite." May this not be indicative of a different toxin (I use the word for want of a better in our present ignorance) for each parasite, or of differences in the chemistry of the blood of the different kinds of host, or of both?

It seems to me that there lies here before us a wide field for research, for the further application of the opsonin theory, and possibly paving the way for an antitoxin treatment of helminthiasis.

Let me turn now to a subject of even greater importance.

Of all the advances in biological science of recent years, none are of wider interest or of greater practical importance to the breeder, and one may say to the human race, than the discovery of certain principles of heredity by Gregor Johann Mendel. This great man, born on July 22, 1822, at Heinzendorf, of Austro-Silesian parents, entered as a novice the Augustine Convent at Altbrünn, and afterwards became a teacher of natural science at the Realschule in Brünn. It was during this latter period (1853-1868) that he devoted much of his time to the

cross-breeding of a large variety of plants. Upon his appointment as Abbot of his monastery in 1868, his scientific activities were considerably curtailed by the duties associated with his new office; nevertheless, the work of the preceding fifteen years had been sufficiently great, and his records so careful and exact as to have formed a very solid foundation upon which a vast superstructure is being daily raised by workers in all countries.

Mendel's first experiments in hybridization were made with the eating pea—*Pisum sativum*—and his results were published in the *Proceedings of the Natural History Society of Brünn* in 1866. For over thirty years his work remained unknown, until in 1899 the main facts were rediscovered by de Vries, Tschermak, and Correns; and in our country they have been brought prominently before the world by Bateson, who, with his pupils Punnett and Doncaster, has added so greatly to our knowledge of heredity. Before drawing attention to the great practical application of Mendel's work, I may briefly outline the principles, taking for illustration one of his own experiments.

He selected plants with pairs of characters such as tallness and shortness, and made crosses between the tall and short varieties, selecting only those which he had proved to breed "true." Tall plants alone resulted from the first crossing (F 1). The character of tallness he called Dominant, and that of shortness he called Recessive. The seeds from these tall forms were collected and sown again the next year, and in the resulting second generation (F 2) some plants were tall and others short in the nearly accurate proportions, 3 to 1. If the seeds of the dwarf forms were then planted they gave rise to nothing but dwarf forms for however many generations they were carried on—*i.e.*, they bred true. But if the seeds of the tall forms were planted, it was found that they again gave rise to tall forms, but by growing them through further generations, he showed that they were not all of the same nature—some were pure tall, others impure tall, in the proportions of 1 to 2—that is, that the pure tall now breed true like the recessives of the previous generation, whereas the impure dominants (tall) again yield dominants and recessives in the constant proportions of 3 to 1. We thus see that a tall form may be a pure dominant, and will therefore breed true, or it may be an impure dominant—*i.e.*, though it appears as a dominant tail form, it really carries the recessive character of shortness within, though latent, as proved by the fact that some of the descendants of the next generation will exhibit that dwarf character.

Large numbers of characters have been dealt with in the same way both in plants and animals. The coloured coat of mice and rabbits is dominant over the albino coat. The short fur of rabbits is dominant to the long "angora" coat; the "rose" comb of Wyandotte fowls is dominant to the "single" comb of Leghorns and Andalusians.

Professor T. B. Wood has also shown, by crossing Dorset horn sheep with the Suffolk hornless breed, that horns are dominant in males and recessive in females [17].

Cases are, however, met with in which the hybrid of the first generation is intermediate in character between the two parents, as is shown by crossing a lax-eared with a dense-eared wheat. But when the seeds of the hybrid are sown the next generation (F 2)

they give one quarter dense, one quarter lax, and two quarters intermediate, the last again behaving in the same way in the next generation. The dense and the lax thus reappear after skipping a generation, and then continue to breed true.

In an address of this nature it is impossible to go into the various explanations of the results and of the various theoretical deductions as to gametic segregation, gametic coupling, &c.; but they are all adequately dealt with in books devoted to Mendelism. I wish now rather to draw your attention to experiments on the same lines in respect of characters of marked practical importance.

Professor Biffen, of Cambridge, finds that there is a variety of wheat which is rust-proof, a small-eared variety without any good qualities beyond its immunity to rust. Another variety is exceedingly susceptible to rust, but formed long ears. These two varieties have been crossed, and Biffen finds that immunity to rust acts as a recessive character. By definitely selecting the crossings through several generations it is found possible to get a wheat "which will bake as well as the best Canadian, and, since they will be free from disease, crops better than any varieties at present on the market" [13]. To quote again from a paper by Professor Wood and Punnett, this "possibility of transferring immunity to disease from one variety to another is an achievement of the greatest scientific and practical importance. It seems to offer the most hopeful method of checking disease yet suggested. If immune strains of any species of plant or animal can be found, no matter how useless they may be from other points of view, there seems to be no reason why their immunity should not be transferred by crossing to our present valuable varieties which are being ravaged by disease. In this way it may be found possible to produce high-class horses and cattle immune to the diseases which are the scourge of the South African farmers, sheep which will be proof against anthrax, black quarter, and other diseases that attack sheep at home, and pigs immune to swine fever."

It may be that some may regard these possibilities as Utopian, and not justified merely by what has been found possible in wheat. Is there any evidence that disease in animals behaves as a Mendelian character? From the nature of the case the evidence in animals is as yet much more scanty than in plants, but it is quite sufficient to raise most sanguine hopes.

Some very remarkable pathological examples of Mendelian heredity in the human being are the cases of brachydactyly investigated by Farabee in America and Drinkwater [3] in Edinburgh. This condition, affecting hands and feet, and associated with short stature, is a dominant character and behaves in a simple Mendelian way. Without going into details, it is possible from a study of these cases to confidently prophesy that no unaffected member of the family will transmit the disease to his or her children, but that it will most certainly be transmitted by the affected members, and by them only. Congenital cataract is another condition which seems to behave as a simple Mendelian dominant to the normal [8].

These are comparatively simple cases, but there are those of sex-limited diseases where the disease is present generally, if not always, in members of one or other sex only—for example, males; in such cases the females, unaffected themselves, may, and usually do,

transmit it to their sons, but not to their daughters. This is the case with some forms of hereditary night-blindness; the males only are affected, with descent through the normal-sighted females [8].

Several other diseases are under investigation—hereditary chorea, diabetes insipidus, deaf-mutism, hæmophylia, and many diseases of the eye and nervous system [9].

It is getting now possible to predict with some degree of accuracy which of the offspring, male or female, of an affected person will in turn be affected. Beyond prophecy and advice, little can be done with human beings; "Man will aye gae his ain gait," and "Wilful woman will have her way." But in the case of animals this is quite different.

May we not see here opening up a field of vast importance to the breeder and to the veterinary surgeon? One more point before I close. I would like to draw your attention to a very suggestive paper by Major F. Eassie, D.S.O., of the Army Remount Department [3], published in the *Scientific Proceedings of the Royal Dublin Society* for March last, on "Some Variations in the Skeleton of the Domestic Horse, and their Significance." The authors gives proofs of deterioration in the domestic horse, as compared with the wild horse.

Though the evidence furnished is not sufficient to state that the points in a horse dealt with in the paper do behave as Mendelian characters, the paper seems to me to be extremely suggestive of the lines upon which breeders might work in the selection of their animals. As the breeding of horses and the improvement of the breed are now very much to the front, I would commend this paper to your notice.

Time will not permit me to go further into these interesting and important subjects. I hope I have said sufficient to prove the thesis with which I started—that all these matters, whether in regard to parasitism or heredity, are of immense practical value, and that they all had their origin in the apparently useless work of the pure and unpractical scientist. We see here an answer to Faraday's question, What is the use of a baby?

Further, I hope I have successfully demonstrated the value of a knowledge of biology to the student, and its importance as a subject in the veterinary and medical curricula. The shafts so constantly aimed at biology should as a rule be aimed not at the subject but at the syllabuses which educational authorities lay down. Taught, as it should be, with due regard to general principles, I hope the day when biology is banished from our medical colleges and relegated to the position of a school subject may never come. It would then be taught by untrained persons whose sympathies might be in entirely other lines, possibly not even scientific, and without any regard to its future application by the student.

It seems to me to be becoming more and more evident that the centre of gravity of medical education is shifting from the pathological to the biological laboratory, and hence rather than crushing the subject it will have in the future to be more and more fostered. The great importance of biology has been recognized in the University of Cambridge by the foundation within the past few years of two chairs of biology: the Quick Professorship held by Professor Nuttall and devoted more particularly to the subjects of protozoology and parasito-

logy; the other chair now occupied by Professor Punnett, and previously by Professor Bateson, to the study and investigation of all problems connected with heredity.

I am aware that we are all open to the charge of believing that our own particular subject is of all others *the* most important; but I do seriously think that the importance of biology in the medical curriculum is not sufficiently appreciated. In addition to the general elements taught to first year's students, I think a second and more applied course should be taken by the more senior students concurrently with their pathology, dealing not only with parasitism and heredity, but with the animals which are so important in the transference of disease—leaches, flies, ticks, mosquitoes—and now even carcinology is coming to be recognized as of importance.

I am of opinion that the biological departments of our medical colleges should be given functions, wider and more important than the teaching of first year students in the elements of biology, as a sort of introduction to anatomy and physiology and to fill up their time until they have passed in chemistry and physics. Biologists ought to take an important share in the teaching of our senior students and post-graduates. I am referring not to this college or to the veterinary curriculum only, but to all medical colleges, all medical education. And above all I would like to see them becoming centres for research. Research I regard as a most important factor, stimulating both teacher and taught. Where no research is carried on, both teaching and learning are apt to become mechanical, lifeless, and uninteresting.

Your profession, extending as it does throughout the world, has its focus in this metropolitan College. There is no other place where such subjects as the *phenomena* of parasitism (not merely the collecting, identification, and cataloguing of specimens) and the hereditary transmission of disease, and I would add also, of desirable qualities in animals—for this is of equal importance—could be better studied, owing to the vast stores of available material.

May I conclude with a practical suggestion? It is that there should be established in this College a central bureau for the collecting of data, supplied by the members of your profession who are in practice and in touch with the material, and who have such ample opportunities for helping. The collecting of such data would give them an active interest in the work, keep them in touch with their College, and would add greatly to our knowledge.

The ever-recurring objection, want of money, will be at once raised. Would it not be possible to form an association of former students, each member subscribing a guinea or even half a guinea a year, to found a post-graduate research studentship to investigate some of these important and pressing questions? As soon as some practical results were forthcoming I have sufficient faith that some of our more wealthy men, interested in horse and cattle-breeding, would come forward and help. As men of affairs they naturally will not put money in a slot from which nothing is to be extracted.

Finally, I would commend this suggestion not only to the Governors of this College but also to the notice of the Royal College of Veterinary Surgeons. They could do no work more useful to the profession and to the community at large than to establish a department for collecting data, and working out all questions relating to heredity in animals.

REFERENCES.

[1] BIFFEN, R. H. "Mendel's Law of Inheritance and Wheat Breeding," *Journ. Agri. Sci.*, vol. i., 1905, pp. 4-49.

[2] CALKINS, G. N. "Protozoology," London, 1910.

[3] DRINKWATER, H. "An Account of a Brachydactylous Family," *Proc. Roy. Soc. Edin.*, vol. xxviii., 1907-8, pp. 35-57.

[4] EASSIE, F. "Some Variations in the Skeleton of the Domestic Horse and their Significance," *Sci. Proc. Roy. Dublin Soc.*, vol. xii., No. 27, 1910, pp. 321-330.

[5] FEARNSIDES, E. G. "The Blood Changes in Man caused by the Presence of Metazoan Parasites and their Aid in Diagnosis," *Proc. Assoc. Economic Biologists*, vol. i., part 3, 1907, pp. 126-140 (*Résumé* of Literature).

[6] GIARD, A. "La castration parasitaire," *Bull. Soc. Dep. du Nord*, vol. x., 1887, pp. 1-23.

[7] LOOSS, A. "Einige Beobachtungen über die Infektion *Ankylostomum duodenale* von der Haut aus," *Zeitschr. Klin. Med.*, Bd. 58, pp. 41-83.

[8] MINCHIN, E. A. "Sporozoa," "Treatises of Zoology," part i., Second Fasc., Oxford, 1903.

[9] NETTLESHIP, E. "Some Hereditary Diseases of the Eye" (Bowman Lecture). *Trans. Ophthal. Soc. Lond.*, vol. xxix., 1909, pp. 57-198.

[10] NEUMANN, L. G. "Treatise on the Parasites and Parasitic Diseases of the Domesticated Animals." Eng. Transl., London, 1905.

[11] POTTS, F. A. "The Modifications of the Sexual Characters of the Hermit-crabs caused by the Parasite *Peltogaster*," *Quart. Journ. Micr. Sci.*, vol. l., 1906, pp. 599-621.

[12] PUNNETT, R. C. "Mendelism in Relation to Disease," *Proc. Roy. Soc. Med.*, 1908, pp. 1-27.

[13] SHIPLEY, A. E. "A Cause of Appendicitis and other Intestinal Lesions in Man and other Vertebrates," *Parasitology*, vol. i., 1908, pp. 263-279.

[14] SMITH, GEOFFREY. "Rhizocephala," *Fauna u Flora Golfes Neapels*, vol. xxix., 1906, pp. 65-98.

[15] TURNER, G. A. "Bilharziosis in South Africa," *Parasitology*, vol. i., 1908, pp. 195-217.

[16] WOOD, T. B., and PUNNETT, R. C. "Heredity in Plants and Animals," *Trans. Highland and Agricultural Soc. Scotland*, vol. xx., 1908, pp. 36-87.

[17] WOOD, T. B. "The Inheritance of Horns and Face Colour in Sheep," *Journ. Agri. Sci.*, vol. iii., 1909, pp. 145-154.

BACHELOR OF VETERINARY SCIENCE DEGREE, UNIVERSITY OF MELBOURNE, AUSTRALIA.

THE first examination for this degree was conducted by the University of Melbourne during August 1, 2, 4, and 5.

The subjects were advanced surgery, pathology, and bacteriology, the contagious diseases, parasitology, State and municipal hygiene, and plant pathology. The written examinations occupied ten hours, the practical examination in pathology, bacteriology, and parasitology, four hours, and the oral examinations ten hours. The Board of Examiners consisted of J. A. Gilruth, D.V.Sc., M.R.C.V.S., F.R.S.E.; A. J. Ewart, D.Sc. (Oxon., Lond., &c.), Ph.D.; W. Stapley, M.D., M.R.C.V.S.; G. Sweet, D.Sc.; J. White, D.Sc.; S. S. Cameron, D.V.Sc., M.R.C.V.S.; and Sydney Dodd, D.V.Sc., F.R.C.V.S. (of Queensland).

The following gentlemen (who are graduates of the old Melbourne Veterinary College and had attended a special post-graduate course), passed the examination and will be admitted to the degree: Messrs. C. C. Cherry, E. A. Kendall, E. A. Le Souef, W. B. Lloyd Green, N. Macdonald, W. A. N. Robertson, E. A. Weston, and A. B. White.

THE GLASGOW VETERINARY COLLEGE.

(INCORPORATED.)

THE Forty-seventh Session of this Institution commenced on Wednesday, September 28. The Board of Governors have been fortunate in arranging for William Freeman Barrett, Esq., F.R.C.V.S., President of the Royal College of Veterinary Surgeons, London, to deliver the Introductory Lecture, which is to be given on Friday, October 21.

Translations.

A CASE OF DISEASE OF THE CUTIS AND SUB-CUTIS IN THE HORSE.[1]

By CHIEF VETERINARY SURGEON ERNST KRUGER.

A HORSE treated in 1908 for an unknown skin disease continued in hospital during 1909, and was finally killed as incurable. External treatment with sublimate and bacillol solution dermatol in substance and in ointment form, together with extremely careful skin hygiene and dietetic supervision, only caused a slight improvement in the malady and of bodily condition. The internal administration of potassium iodide, formic acid, and so on, did not favourably influence the complaint. Microscopic and bacteriological examination gave no information as to the cause or character of the complaint. It was noteworthy that the horse showed lameness first on one foot and then on the other, and sometimes on two or three at the same time. The lameness mostly occurred suddenly. Examination showed an acute painful inflammation of the laminæ; the horn of the white line as well as that bounding the sole and wall was sodden and yellowish coloured. After poultices, made with vinegar, applied to the feet, the lameness soon declined. By extension of the skin inflammation to the laminæ, this laminitis was explainable. Towards the end of the year 1908 diagnostic tuberculin inoculations were made; there was a rise of temperature very similar to the typical tuberculin reaction in tuberculous men, and together with the other symptoms shown, a suspicion of tuberculosis began to be entertained. During the last weeks of the illness of the horse, and when at rest, the respirations were 16 to 18 and deep, whilst in the area of the under third of the left lung a muffled sound could be heard. No nasal discharge was present. Examination of the accessible lymph glands showed nothing abnormal with the exception that the gland at the upper half of the œsophagus on the left side could not be felt. Very soon after the tuberculin inoculation there was a drying up and healing of the skin affection, as well as an improvement of the appetite and general condition. The dry scabs fell off in great coherent sheets, and the coat became glistening again with the improvement in appetite. The improvement lasted four or five weeks, but very soon after the skin

[1] From the clinic of the Imperial Military Farriery School at Berlin, Annual Report, 1909.

affection, as well as the general bad symptoms, set in with renewed severity, on which account the owner, after nine months further treatment, decided to have the horse slaughtered.

Post mortem showed a considerable number of nodules from the size of a lentil to a hen's egg, in the spleen, liver, in the serosa of the stomach and intestine, on the peritoneum and pleuræ; the portal, the mesenteric and the inguinal glands were swollen as large as one's fist. The microscopical and bacteriological examination in our laboratory showed that the changes were due to tuberculosis. To find out further whether the illness was due to the *Bacillus typus humanus* or *bovinus*, the whole of the material from this patient was sent for examination to the institute for infectious diseases. Just before publication of this report the announcement came to hand that examination had shown the complaint to be due to the *typus humanus* organism.

(*Zeitschrift für Veterinärkunde.*)

A CASE OF INTERNAL SUPPURATIVE OTITIS IN A DOG.

By M. MATHARNAN.

Veterinary-Surgeon to the Remount Depôt at Caens.

A FOX-TERRIER, aged 14 months, the property of Captain X., showed auricular catarrh of the right ear since May, 1909. Since the appearance of the malady the animal had been entrusted to me to carry out appropriate treatment. All the series of drugs to combat this complaint had been tried without result. Daily lavages of the affected region with warm boracic solution, followed by oxide of zinc ointment, 1 in 8, to the interior of the ear, iodized glycerine, dermatol, salicylated vaseline, employed successively, yielded no good result. In spite of this treatment the suppuration of the ear never dried up; it was never very abundant, but finally it became of a fœtid odour. The general state of the subject was always satisfactory.

In presence of this rebellious case of auricular catarrh, and after having minutely examined the buccal and nasal passage, I decided to try surgical intervention, believing that there was a purulent collection, of unknown origin, in the ear. The dog was anæsthetized by an intra-peritoneal injection of a solution of chloral and morphine, and an incision about 4 cm. long made at the level of the base of the ear and its external side. Nothing abnormal in the external ear; the membrane of the tympanum was punctured, a probe of small calibre introduced by this opening, and a brown awn extracted. By means of forceps three other brown hairs were extracted from the middle ear. The operation was concluded by irrigating well with oxygenated water and providing for drainage with some aseptic gauze. The lips of the wound were sutured, and a bandage put on, which was renewed forty-eight hours afterwards.

Unfortunately the dog died of pulmonary congestion some days later.

Reflections on Anæsthesia of the Dog by Richet's Procedure.

The method employed to anæsthetize the animal consisted in an intra-peritoneal injection of chloral and morphine by means of

a Pravaz syringe, and with all antiseptic precautions. In this procedure the doses were: Chlorhydrate of morphine, 2·5 milligrammes per kilo of the animal; chloral, 5 decigrammes. Three to four minutes after injection complete anæsthesia was obtained, immediately followed by syncope, causing an apparent state of death: complete arrest of respiratory movements, suppression of the corneal reflex, pulsations of the femoral artery very rare and hardly perceptible. Artificial respiration practised immediately; rhythmic tractions of the tongue, extension and reflexion of the anterior members, and moderate pressure on the thorax. This manœuvre carried on for two hours and a quarter. At this time respiratory movements reappeared slowly, as well as the corneal reflex.

Reflecting on this anæsthetic accident, probably due to too large a dose of chloral, the following formula is advised: Chlorhydrate of morphine, ·5 grm.; chloral, 10 grm.; water, 100 grm.

Inject 1 c.c. of this solution per kilogramme of the animal weight into the peritoneum. This solution has always given excellent results, and never occasioned accidents.

This observation has appeared interesting to us from three points of view:—

(1) The fact of having encountered in the middle ear a foreign body made up of brown awns.

(2) Practise anæsthesia of the dog cautiously with the solution of chloral and morphine.

(3) When one encounters a rebellious auricular catarrh in a young dog, one should remember the possibility of a foreign body in the ear, and not hesitate to intervene surgically.

(*Revue Générale de Médecine Vétérinaire.*)

Books and Periodicals, &c., Received.

Journal of the Royal Army Medical Corps; Transvaal Agricultural Journal; Agricultural Journal of the Cape of Good Hope; L'Étoile Belgique; Bulletins of the Bureau of Sleeping Sickness; Bureau of Animal Industry (U.S.A.); Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

Letters and Communications, &c.

Mr. E. Bell, Anti-Bearing Rein Association; Dr. Burton Rogers, Kansas Veterinary Medical Association; Dr. Guisseppe De Cortes (Sardinia); Mr. S. Stockman; Mr. W. Cargill Patrick; Mr. W. Moodie; Dr. Tims; Professor Gofton; Professor O'Connor; Mr. N. Meyers; Dr. Stapley; Mr. J. Perry; Captain Leaning; Captain Swanston.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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THE

VETERINARY JOURNAL

NOVEMBER, 1910.

Editorials.

THE PAYMENT OF MEMBERS OF THE COUNCIL OF THE ROYAL COLLEGE OF VETERINARY SURGEONS.

THE discussion at present being carried on in political circles on the question of the payment of Members of Parliament has its counterpart in a very small way in the politics of our own profession. The members of the Council of the Royal College of Veterinary Surgeons have always given their services freely, and we believe ungrudgingly, in the interests of the profession to which they belong. The profession as a whole is indeed grateful to those gentlemen, and they have need to be. Those gentlemen have not only given their time and services, but they have also paid their own expenses, which in the case of members from a distance must be very considerable. This is all very well in its way, but it has had one effect which in the eyes of some members of the profession is not quite desirable. It has resulted in a majority of the councillors hailing from the South, and from large towns so that country practitioners, and those in districts remote from London consider that they are not adequately or even directly represented on the ruling body. It is useless to retort that they have the vote and so can take part in the elections, but how can a small body of men such as, say, the Welsh practitioners, or those in the North of Scotland hope to outvote the numerous London and suburban practitioners? We are afraid they cannot hope to do so. There is, however, another

very important cause contributing to the present state of affairs, viz.—the difficulty of getting suitable men from long distances to consent to be nominated for the Council owing to the great expense entailed. The late Mr. W. Byrne repeatedly stated to us that his actual out-of-pocket expenses during his term on the Council were over £50 per annum, to say nothing of the loss he must have sustained by the neglect of his practice while attending meetings in London every quarter.

A few weeks ago a country practitioner from the North was complaining to us about some fancied grievance he had against the Council. He said the Council did not care a rap for the country practitioners, as they themselves were almost all town practitioners or elderly men who had "feathered their nests." We did not agree with the statement, and when he was taken to task and asked to mention any other good business man, a country practitioner, who would be prepared and feel justified in neglecting his practice, and at the same time willing to pay anything approaching even £25 a year out of his own pocket for the benefit of his profession, he was silent. He later confessed that he was one who had protested against being asked to pay one guinea a year for the protection of his own interests, but if there was any probability of the proposed new Bill remedying this state of affairs he would withdraw his opposition and gladly contribute an annual fee.

We do not suggest for one moment that members of Council should be paid for their services, and we do not believe that any one of them desires anything of the kind. To be elected to the Council is about the only honour our profession can bestow upon its members, and recognizing that, the councillors give their services freely and ungrudgingly, and do the best they can with the funds at their disposal for the general welfare of the profession.

But ought we to ask so much from them? Ought we to put them to such expense as is entailed by their proper attendance at Council meetings? Such a system certainly makes it quite impossible on financial grounds for many good, shrewd, business men to accept the only honour we could confer upon them, and robs us of their valuable services.

Hence it is that we consider one very great reason why the proposed annual fee should be instituted, that members of Council should have their travelling expenses paid. Then it might be possible to get more direct representatives of general practitioners in Wales, Ireland, and the North of Scotland. As at present constituted there is only one general practitioner on the Council from Scotland, and none from Wales or Ireland.

G. H. W.

THE TREATMENT OF ACUTE LAMINITIS.

In the VETERINARY JOURNAL of last December we recorded an interesting clinical note by Mr. Philp on "The Use of Adrenalin in the Treatment of Acute Laminitis." We added a footnote in support of this line of treatment, and asked for further reports from any practitioners adopting it. It is, consequently, with great pleasure that we record in this issue two cases treated successfully by this method by Captain Jolliffe. Both cases would appear to have been very acute, and that recovery should be so complete in both cases is certainly very gratifying. The injection of adrenalin over the plantar arteries undoubtedly diminishes the amount of blood going to the feet, and in that way diminishes the congestion and pain. If the congestion is early relieved, then as a consequence the probability of exudation between the horny and sensitive laminæ with "dropped sole" and permanent changes is diminished. Hence we consider that this method of treatment, if adopted in the early stages, should reduce the severity of the attack, curtail its duration, and diminish the probability of untoward sequelæ. We should be glad to receive more reports of its trial and the results obtained, whether favourable or otherwise.

G. H. W.

General Articles.

THE CAUSATION OF RICKETS.[1]

By FREDERICK W. COUSENS, M.R.C.V.S.
London.

MANY and varied have been the causes assigned for rickets. Almost every prejudicial circumstance in the life of the infant—and in that of the parent too, for that matter—has been cited as the etiological factor.

ETIOLOGICAL THEORIES.

According to Kassowitz and some of the German school, it is of congenital origin, a theory, however, mainly founded, at least by its earliest adherents, on macroscopic appearances alone, and not on the finding of any characteristic histological changes in the bones. In every infant the bones are soft, the abdomen may be protuberant, the fontanelles will be open, and there will be some swelling of the costo-chondral junctions, and yet it was on the ground of these facts alone that such a theory was based. The later advocates of this theory, however, did examine the minute histological changes in the bones, but as much of the material studied was obtained from stillborn children, and as the pathological anatomy of osteochondritis syphilitica and rachitis was at that time only imperfectly understood, these two conditions were much confused, and it is not improbable, therefore, that many of the supposed rachitic lesions were in reality of a syphilitic nature. As these two processes came to be differentiated from one another, each succeeding published record of work done on this subject showed a marked diminution in the proportion of congenital rickets. Kassowitz in 1882 considered that 80 per cent. of all children born were rachitic: in 1897 Tschistowitsch put the proportion at 12 per cent., while more recently (1902) Escher, after investigating a large series of cases both clinically and histologically, was only able in one single instance to make a diagnosis of congenital rickets.

There is, of course, such a condition known and described as "fœtal rickets," but it is considered by the majority of observers an entirely different disease from that which ensues after birth, and is, moreover, as rare as ordinary rickets is common. It will probably be better then, at least for the present, to classify it apart, and designate it by one of its pseudonyms—for example, "osteogenesis imperfecta."

[1] Paper presented at the Meeting of the National Veterinary Association, 1910.

Closely allied to the above theory (congenital origin of rickets) is that mainly advocated by Siegert, who holds that the condition is hereditary, and dependent on some inherited weakness or predisposition. This, after all, is merely a case of begging the question and failing to discuss the main points at issue. Hausen, however, reports the case of a stallion who begot seven rachitic foals. Later, two of the mares, one of which had given birth to three and the other to two of these rachitic foals, became pregnant to another stallion, and bore healthy non-rachitic offspring.

It is during extra-uterine life, however, that most present day authorities believe the etiological factors play their part, and the

FIG. 1.—The two collie puppies, ten days before death. Note the extreme degree of bending of the forelegs in the rachitic animal.

general consensus of opinion would ascribe the disease to incorrect feeding, bad hygiene, and want of sunlight. Of all these possible malign influences it is some error in feeding which receives most credence and support. By some it is said to be due to an entire want of suckling, to the mother not nursing the child long enough, to suckling at too frequent intervals, and by others again to prolonged lactation. Siegert found that out of 845 artificially fed infants 81 per cent. developed rickets, while in 923 infants who had been nourished at the breast for at least four and a half months, only 31½ per cent. became rachitic. On the other hand, Holt mentions that although

negro and Italian children in New York are entirely breast-fed, they are exceedingly prone to develop the disease.

In artificially fed infants and in the feeding of children, almost every possible quality and combination of the different constituents have been credited with the power of inducing the disease. Some say it is consequent on a deficiency of proteid, others on an excess of carbohydrate, but perhaps the majority consider that it is due to a deficiency of fat and proteid with an excess of carbohydrate. This is a combination of factors which, it must be remembered, may be present in the food of both naturally and artificially fed infants. According to Holt and Cheadle it is in the presence of a low per-

Fig. 2.—Longitudinal sections of bones of hind legs from healthy animal showing normal conditions. From rachitic animal showing the thinning of shafts, and great irregularity and widening of epiphyseal lines.

centage of both fat and proteid that rickets is liable to result, while Bland-Sutton teaches us that it is entirely due to a deficiency of fat. The latter's well-known experiments in the London Zoological Gardens with the lion cubs and young monkeys lend great support to his view. By only one change in the general *régime* of these animals, namely, the addition of fat and cod-liver oil to their diet, lion cubs were reared free of rickets for the first time in ten years. Ashby, while lending his support to the idea of a low percentage of fat and proteid, considers that it is not improbable that fermentation

of the carbohydrates may produce toxins which are responsible for at least some of the phenomena of the disease. Heitzman [3] considers that "lactic acid" is the baneful product, and claims to have induced the condition experimentally by its administration. He believes that the lactic acid results from the fermentation of the carbohydrate and irritates the ossifying tissue; but other observers have not been able to confirm this formation of lactic acid, and have failed to bring about rachitic changes by its administration.

Esser [4], who has lately written on the subject, believes that the disease is due to over-feeding, and bases his theory mainly on the similarity of the blood pictures in rickets and chronic over-feeding. He contends that over-feeding produces a chronic gastro-enteritis, and results in a deficient absorption of the food constituents. Cheadle [5], too, in one place speaks of rickets ensuing on starvation, which is, however, contrary to clinical experience.

Considering the fact that the rachitic changes in the bones are in great part characterized by deficient calcification, it is not surprising that some observers have looked for the etiological factor in a defect of lime metabolism. It has been attributed to an absence or deficiency of lime in the food, to a defective anabolism of the lime salts, and, lastly, to an increased katabolism of these same salts—in short, to all the possible variations in the process of calcification. Chossat [2] produced curvature of the bones experimentally by depriving animals of earthy salts, but Friedleben doubted the condition being true rickets. Voit [6] also believes that he was successful in causing rickets by depriving animals of calcium. Katz [7] saw typical rickets in a fowl which had been confined in a narrow cage for some months, and which he considered due to the fact that the bird could not get a sufficient amount of lime. Reimers and Boye [8] also noted some changes in the bones of dogs fed on a diet poor in lime, but very different from that they observed in cases of spontaneous rickets. The bones in the experimental animals were soft, with some thickening of the epiphyses. The bony trabeculæ were merely thinned and did not reveal the presence of any osteoid tissue. In cases of spontaneous rickets, however, the epiphyses were enormously thickened and much osteoid tissue was present. That it is due to a want of lime is unlikely when one considers that farinaceous foods and cow's milk—the diet on which rachitis is supposed to flourish—contain more than an abundance of that substance. There is no doubt, of course, that during the rachitic processes there is a deficient absorption of lime by the newly-formed bony tissue, and just as truly is there an increased

katabolism of the same salts, but it is just on what this perversion of metabolism depends that the crux of the whole question lies.

Hygiene and climate are acknowledged by most authorities to play some part in the etiology of rickets, but only to a slight extent, and in a very general way. To this question, however, I will return later.

The infective theory has been mooted by many, but as yet there is no definite proof in favour of any such idea. Drs. A. Torane and Salvatore Forte [9] believe they have induced the disease in rabbits by inoculating them with watery and alcoholic extracts of the fæces of children suffering from rickets and diarrhœa. Curiously, though rachitis changes are said to follow on injection of either the alcoholic or watery extract, a mixture of the two extracts is quite inactive.

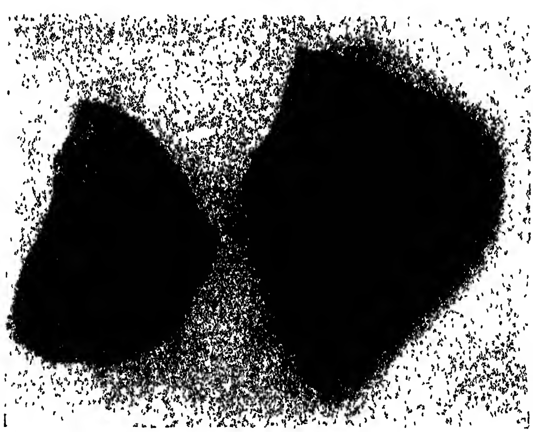

FIG. 3.—Inner aspect of the thoracic walls in healthy and rachitic animals. Rachitic animal showing the marked rosary or nodules at the junction of the ribs and sternum.

Moussu [10] also is of opinion that it is an infectious disease, as he caused a healthy animal to take rickets by confining it in a cage along with a rachitic one; and then, without subsequent disinfection, he confined another healthy animal in the cage, and it also in turn succumbed to the disease. This experimenter, in addition, inoculated various kinds of animals with emulsions of rachitic bone-marrow, but without any effect, unless he injected what he calls a very virulent material, and also confined the animals in the above-mentioned or some other similarly infected cage.

Syphilis, too, has been considered answerable, and it is possible that it may act as a predisposing factor; but that it is the prime etiological cause, as Parrot [1] and Marfan [11] consider, is a view

which has not received much support in this country, and seems, moreover, to be entirely negatived by the fact that rickets can be easily induced in the lower animals.

The Effects of Deprivation of Exercise.

The great diversity of opinion which prevails regarding the etiology of this disease is shown by the above brief account of the various theories, and is sufficient proof that as yet the true etiological factor has not been discovered. Rievel [12] while summing up the recent work on this subject, suggests that rickets may not have the same origin in all cases, and that many factors may play a part in its causation.

Fig. 4.—Sections of bones of forelegs of the two collie puppies. Healthy puppy. Rachitic puppy: Note the bending of the humerus, and the great thickening of the epiphyseal lines in the radius and ulna of the rachitic puppy.

It is my intention, however, as the result of some experimental work which I have recently carried out, and by a critical survey of the various influences which affect the child, to show that there is one factor, and that a very potent one, in inducing the disease—namely, want of exercise.

Lack of exercise as a factor in the pathology of the disease has received remarkably little attention, though to my mind it is of the utmost importance, and in future will always require to be taken into consideration when discussing experimental rickets. Though confine-

ment is mentioned by several authors, its mode of action is either misunderstood, or it is supposed to work along with some other baneful influence, and to play a subsidiary part. Dudgeon [13] believes that it acts through lack of fresh air and sunlight, while Clement Lucas [14] mentions it as a contributory factor to incorrect feeding, and Esser [4] to overfeeding. By depriving young dogs of exercise I invariably induced the condition, though they received as much fresh air and sunlight as the control animals. Moreover, their kennels were cleaned regularly. It is not an uncommon experience for experimental animals to develop rickets, consequent, I believe, on the confining of the animals in cages, an almost invariable practice in experimental work. In this way we can explain the case of the rachitic fowl reported by Katz, and also the results of Moussu's experiments. It is in a similar fashion that climate exerts its influence. In warm, genial climates the children will be out much during the day, while in temperate and treacherous climates like our own, especially during the winter, children are exceedingly likely to be cooped up in the house for days, and even weeks, at a time.

It was some two years ago, when commencing an investigation of experimental rickets, that my attention was first attracted to this subject. I attempted to produce rickets in puppies by modified feeding, giving them such generally recognized rachitic diets as bread and water, oatmeal and water, and rice and water, and yet not one developed the disease. They invariably wasted, became marasmic, and died, thus confirming the well-known fact that marasmic infants never become rachitic. But the control animals, at least those which did not become atrophic consequent on diarrhœa, though being fed normally—as, for example, on milk and porridge—all became affected.

In the first series of experiments three control animals developed rickets, one of them, however, less severely than the other two. This animal was fed in a similar fashion to the others, and spent most of its time in their company; but, owing to the fact that it was ultimately intended as a companion, it was exercised by its prospective owner once or twice daily. Accordingly it seemed to me not improbable that in the confinement and want of exercise—the only abnormal factor in the *régime* of these animals—one had to deal with the etiological factor. I allowed the comparatively healthy animal to get still more exercise for about a week, when all appearances of rickets practically disappeared. On once more confining him with his brothers and sisters he again rapidly became affected. Two of this litter suffered so severely that they were unable to walk, and merely shuffled about

the floor of the kennel as if they were affected with paraplegia or diplegia. Similar experiments have been carried out on two other sets of animals, with exactly the same result. By subjecting the animals to no other abnormal condition than the want of exercise, marked rachitis has invariably ensued.

The table given comprises my observations in chronological order on sixteen animals. Nine of these were treated by confinement and deprived of exercise, but they were fed normally. One (No. 14) died of marasmus, too early, however, to allow of the development of the disease, but the other eight (Nos. 2, 4, 5, 8, 9, 10, 11, and 15) became rachitic to a marked degree. Two (Nos. 1 and 3) were treated by modified dieting and were allowed exercise. Both died of marasmus, but without showing any signs of rickets, although they lived beyond the age at which the disease usually appeared in the experiments. The other five (Nos. 6, 7, 12, 13, and 16) were used as controls. They were all allowed exercise, but as regards feeding, housing, and hygiene were treated in a similar fashion to those which developed the disease, and they all remained entirely free of any rachitic manifestation.

I will quote in more detail my last series of experiments. I obtained three collie pups, aged 2 months, from one litter. These three animals were kept in one house, were fed in exactly the same manner, on a diet of oatmeal porridge and milk, and were subjected to the same atmospheric conditions as regards amount of sunlight, warmth, and purity of air. Two, however, were confined in a small cage closed on either side but open above, and only covered in front with wire netting, while the other was allowed to run about the room at large and play with a cat. All three at first suffered from diarrhœa, and one of the confined animals in subsequence died, but without showing the slightest evidence of rickets. The other two recovered, and steadily put on flesh, and they increased in weight by almost exactly the same amount each week. The puppy allowed to run about developed along normal lines, while the one confined ultimately became rachitic and presented a very typical picture. Fig. 1, from a photograph, shows the contrast between the two animals. The rachitic pup continued to take his food well, and was not troubled with diarrhœa. The first change noticed was a certain degree of languor. When allowed out of the cage he seldom frolicked about, and he was unable, except with the greatest difficulty, to ascend even a very gradual stair. His legs ultimately became bandy, and the beading of the ribs got more marked. His lethargy increased and he lost strength, and, though almost as large and as heavy as his

sister, he was frequently overturned by her simply knocking against him.

Post Mortem.—The difference between the bones of these two animals was most apparent. In the control the bones were straight and firm, the costo-chondral junctions normal in appearance, and the epiphyseal lines narrow and regular. In the other animal the long bones were curved and exceedingly soft, the epiphyseal lines were broad and irregular (fig. 2), and there was marked swelling with hyperplasia of the costo-chondral junctions.

In this paper I only intend to deal with the etiology of the condi-

FIG. 5.—Photomicrograph of a section of rachitic bone stained with thionin blue as advised by Schmorl for the demonstration of bone cells. Note the presence of much osteoid tissue and the dwarfed processes and irregular arrangement of the bone cells.

tion, and consequently will not devote much space to the pathological changes. In order, however, to show that the condition I had induced experimentally was in reality rickets, it may be advisable to recount the main histological findings in the bones. I contented myself by examining the ribs and long bones. As previously mentioned, the bones were soft and pliable, and in some instances could be flattened between the finger and thumb. This pliancy of the bones was most striking in comparison with the hardness of the bones of normal animals. There was distinct swelling of the epiphyseal ends of the

long bones and of the costo-chondral junctions (fig. 3). Section of the bones revealed enormous thickening of the epiphyseal lines, which measured in some instances 12 mm., and great irregularity and increased vascularity of the same (fig. 4). Microscopic examination showed much hyperplasia and irregularity of the epiphyseal cartilage —deficient calcification at the growing zone with the development of much osteoid tissue (fig. 5). The osteoid tissue was, however, more cellular than that occurring in human rickets, but this can perhaps be accounted for by the more rapid development of the disease in the experiments. The little bony tissue present was composed of cells

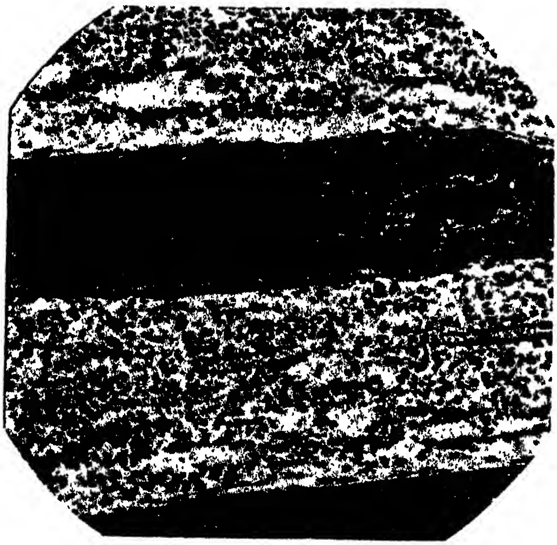

FIG. 6.—Section of ordinary bone for comparison. Here there is no osteoid tissue. The bone cells are regularly arranged, and extend right to the margins of the trabeculæ. In one trabecula some unabsorbed fœtal bone is present.

with dwarfed processes irregularly arranged, and contrasted markedly with what occurs in normal bone (fig. 6).

When we come to correlate these experimental findings with the conditions under which rachitic children live, it will be found that there is much to support this theory of the cause of rickets.

Rickets is a disease of the temperate zone, being very rare, and, in fact, practically unknown in tropical and sub-tropical countries. The staple diet in these climates is anything but nourishing, the people living mainly on rice, or some other similar cereal, exactly the kind of food which is supposed in this country to generate the disease. The

TABLE SHOWING RESULTS OF EXPERIMENTS.

Number	Sex	Date when came under observation	Age when came under observation		Treatment	Date when rickets developed †	Cause of death.	Date of death	Time under observation in weeks
1	M	May 11, 1906	At birth	All of one litter	Dietetic	—	Marasmus ...	Aug. 5, 1906	12
2*	F	,, ,,	,,		Confinement	July 21, 1906	Killed ...	,, 17, ,,	14
3	M	,, ,,	,,		Dietetic	—	Marasmus ...	,, 18, ,,	10
4*	M	,, ,,	,,		Confinement	July 20, 1906	Killed ...	,, 23, ,,	15
5*	M	,, ,,	,,		Modified confinement..	,, 30 ,,	,, ...	,, 28, ,,	16
6	F	April 11, 1907	4 weeks	From one litter	Control not confined ..	—	,, ...	June 18, 1907	10
7	M	,, ,,	,,		,, ,, ...	—	,, ...	,, 17, ,,	10
8*	F	,, ,,	5 weeks	From one litter	Confinement	May 14, 1907	,, ...	,, 9, ,,	8½
9*	F	,, ,,	,,		,, ...	,, ,,	,, ...	,, 13, ,,	9
10*	F	,, ,,	,,		,, ...	,, ,,	Broncho-pneumonia	,, 21, ,,	10
11*	M	,, ,,	4½ weeks		,, ...	,, 12, ,,	,,	,, 9, ,,	8½
12	F	June 3, 1907	8 ,,		Control not confined ...	—	Killed ...	July 7, ,,	4½
13	F	,, ,,	9 ,,		,, ,,	—	,, ...	,, ,,	4½
14	M	Nov. 30, 1907	8 weeks	From one litter	Confinement	—	Marasmus ...	Dec. 31, ,,	4½
15*	M	,, ,,	,,		,, ...	Jan. 7, 1908	Killed ...	Feb. 4, 1908	9
16	F	,, ,,	,,		Control not confined .	—	,, ...	,, ,,	9

* Animals which became rachitic.

† These dates are of course only approximate, it being impossible to say exactly from clinical appearances alone when the disease commenced, but at these dates the animals were undoubtedly rachitic.

mothers in these countries no doubt live under more natural conditions and suckle their infants; and, as is well known, in Japan, where rickets is extremely rare, and also in Italy, the mothers suckle their children for unduly long periods, and yet with no untoward results. The climate permits these races to spend much of their time in the open air, and the houses are merely used as sleeping apartments. It is this living so much in the open air which probably accounts for their immunity. As previously mentioned, negro and Italian children, though not subject to the disease when reared in their native lands, become almost invariably affected when dwellers in a city, as in New York, where they are said to be the worst-housed people in the States. The fact that rickets occurs chiefly during the winter months lends further support to this theory. It is during the spring that the city dispensaries are crowded with rachitic children, as a result of the winter's confinement. During the winter, in such a climate as ours, a mother, in order to do her child justice, must be on the watch for, and take full advantage of, every dry half-hour during the day—rather an arduous task for even the best disposed of mothers.

It is a disease which is found chiefly among the children of urban populations, being comparatively rare in the country. Further, it is among the children of the poor and the working classes that we find the disease most frequently, and not among those of the rich. One of the main differences between these two classes of children—the rich and the poor—is that the former has usually a nurse to himself, while the latter has to be content with as much or as little spare time as his almost invariably overwrought mother can devote to him. The one is taken out into the fresh air several hours daily, and is entertained at home in an airy nursery, while the other is induced to lie quiet in bed or in some corner of the kitchen, and give as little trouble as possible. The poor man's child undoubtedly gets out little; his mother may have too many children and has no spare time, or she may not perhaps have the inclination to take her child out for an airing. Or it may be that he is the child of some single or widowed woman, who, in order to earn her livelihood, puts him out to a day nursery, where he may be fed and cleaned regularly, but of exercise and entertainment he will receive a minimum. Moreover, the uneducated are notoriously afraid of fresh air in case their children may catch cold by exposure to the weather, so that, with good intention however, the child may not be out for days or weeks at a time, more especially should he be so unfortunate as to suffer from some bronchial catarrh. Again, in cities the poor live in tenements up many flights of stairs, so that there is

every inducement for the mother to stay indoors. Well-to-do people find living in tenements a deterrent to going out—how much more, then, must this mode of living affect the irresponsible poor. When the labouring man's child is taken out for a walk he is almost invariably tightly bandaged to his mother's side with a large shawl, which must impede the movements of his limbs and deprive him of almost all exercise. The great variation in the incidence of this disease among the poor in the country and in the town may, perhaps, be accounted for by the very different conditions under which they live. The country poor live in cottages, so that the children can be taken out of doors with a minimum of trouble, the very opposite to that which prevails in the town.

FIG. 7.—Rachitic Great Dane three months puppy. (Skeletons on following page.)

This confinement of the children, which we find wherever rickets prevails, does of course deprive them of some fresh air and sunlight, and thus reduce their resisting powers, but it is not entirely, or even mainly, on these grounds that it exerts its baneful influence, as my experiments prove. It is due to the want of exercise which invariably goes along with, or is consequent on, the confinement. Children confined to the house are much more lethargic than those taken out of doors. They sleep more, are less vigorous, and are content to lie at rest without evincing any desire for the exercise of their limbs. Every observant parent and physician must have noticed this, and in the

case of a healthy child it is possible from this fact alone to say whether or not he has been out for his usual airing.

As regards feeding, much of the evidence is of an exceedingly doubtful nature. I cannot believe that the poor in the town feed their children so much less intelligently than those in the country as to

FIG. 8.—Radiographs of Skeleton showing Rickets. Great Dane pup, three months.

account for the great preponderance of the disease among their offspring. Their children are often overfed, but is that not equally true of the well-to-do town child? Does the rich parent never overfeed his child, and does the well-to-do mother invariably, or even usually,

suckle her infant? As is well known, several observers have been unable to induce rickets experimentally by incorrect feeding. Further, is it not during the summer months, when gastro-enteritis is rife and there is consequently a diminished absorption of food, that rickets improves, while in the winter time, with no gastro-enteritis, rickets flourishes? It is questionable, too, if a child, deprived of a sufficient supply of fat and proteid, will steadily put on weight, and yet such is not infrequently observed in both experimental and spontaneous rickets. In all my experiments the animals continued to increase in weight, for some time at least, after the condition had definitely declared itself.

Rickets is admitted on all hands to be an eminently curable disease, its dangers depending on the susceptibility of the children to pulmonary mischief, and on the deformities which result, especially in the female sex. In treating the condition, the physician often pays as much attention to the general hygiene as to the question of feeding, and he may at the same time prescribe cod-liver oil and a hæmatinic, of either of which, however, it is doubtful if much is absorbed. Every-one has had the experience of seeing marked improvement take place in two or three weeks. It may not be possible for these poor people completely to revolutionize the hygienic conditions of their homes, but it is certainly possible to take the child out more often in the open air, to give him a daily bath, and to practise a little massage and passive movement of the limbs. Much more easy is it, to my mind, materially to alter the hygiene of the child than the manner of feeding, even to a slight extent. Will a child who has been accustomed for many months to "the run of the house," with all its attendant delicacies, allow much curtailment of its diet, and remain quiet on a simpler and healthier fare? Even should this revolution in feeding take place, will the intestinal mucosa return so speedily to its normal, and allow of perfect absorption? Again, there are cases in which it is impossible to detect any fault in the manner of feeding, though the mother will frankly admit not taking the child out in case it might catch cold. Holt, though he holds that rickets is due to incorrect feeding, admits that he cannot find any error in the dieting of the negro and Italian children in New York.

In the majority of cases a child develops rickets before it has learned to walk, that is, when it is still dependent on its mother and nurse for its exercise. There are many cases, however, in which the child has commenced to walk only to go off its feet later and become markedly rachitic. Perhaps in most of these instances the condition

is secondary to some illness, as, for example, measles with bronchitis; and, in order to avoid a recurrence of the complication, the child has been kept indoors, and guarded against the slightest draught of fresh air. But there are other cases in which there is no such history of an intercurrent illness, but owing to the mother being pregnant, or ill from some other cause, the child has not been taken out sufficiently often. In neither of these classes of cases can we call to our aid as a cause the manner of feeding: for months the feeding has been the same, and in many instances such as we cannot take the slightest exception to. In all, however, we get the same story of confinement, and the explanation of the condition lies in the want of exercise.

It is on the ground of the above experiments and facts in the child's history that I am forced to the conclusion that want of exercise is the chief etiological factor in this unfortunately too common malady. It is possible that there may be a toxin responsible for the immediate results, but without lack of exercise this toxin will not produce any injurious effects. We may surmise that the lack of exercise and fresh air may be productive of a certain amount of perversion of metabolism, which allows of the generation of some harmful product, and so by auto-intoxication brings about disease. But until this specific toxin is isolated and its nature and mode of formation understood, any such idea is mere theorizing and an easy refuge for ignorance. Typhus fever does not arise *de novo*, and yet we know that somehow or other overcrowding allows the disease to proclaim itself, and by legislation against overcrowding this disease has been kept at bay. Overcrowding and typhus fever are no more closely related to one another than lack of exercise and rickets, and by instilling this fact into the minds of mothers, and especially those of the poorer classes, as well as into corporations who have the welfare of the infant race at heart, rickets would undoubtedly become a very rare disease. Far be it from my intention to belittle dietetics, which is one of the most important branches of pediatrics. Faulty feeding is the cause of much of the infantile mortality, but that it plays any important part in the etiology of rickets is very doubtful.

Conclusions.

(1) Not one of the many theories which have been elaborated to explain the cause of rickets has been universally accepted, and they all lack, not only from the clinical but also from the experimental aspect, unequivocal proof.

(2) It is some error in feeding which, in this country and America,

is commonly believed to bring about the disease, but it is doubtful, however, if feeding plays any important part in the etiology of rickets. Experimentally I, like several other observers, have been unable to cause the condition by improper feeding.

(3) By confining young dogs and depriving them of exercise, rickets has been invariably induced, as in the experiments detailed, and that although their diet was beyond suspicion, the air which they breathed pure, and their kennels were kept scrupulously clean, whereas control animals allowed exercise, but otherwise similarly treated, did not become affected.

(4) Examination of the conditions under which rachitic children are reared reveals one constant and invariable factor in their lives, namely, confinement. Alike, then, on clinical and experimental grounds I accordingly conclude that confinement, with consequent lack of exercise, is the main factor in causing the disease.

[We are indebted to the N.V.A. for the loan of blocks illustrating this article.]

REFERENCES.

[1] CHEADLE. Allbutt's "System of Medicine," 1897, vol. iii., p. 131.
[2] Quoted by Cheadle, *loc. cit.*, p. 128.
[3] HEITZMAN. Quoted by Cheadle, *loc. cit.*, p. 130.
[4] ESSER. *Munch. med. Woch.*, 1907, p. 818.
[5] CHEADLE. *Loc. cit.*, p. 123.
[6] VOIT. *Zeit. f. Biologie*, xvi., p. 55 (quoted by Kievel, *loc. cit.*)
[7] KATZ. *Monatz. f. Tierheilk*, v. i.
[8] REIMERS and BOYE. *Zentralb. f. inn. Med.*, xxvi., H. 39.
[9] IORANE and SALVATORE FORTE, *La Pediatria*, September, 1907.
[10] MOUSSU. *Bull. de la Soc. Centr.*, lvii.
[11] MARFAN. *La Semaine Médicale*, 1907, No. 40.
[12] RIEVEL, LUBARSCH-OSTERTAG. 1907, Bd. ii., p. 609.
[13] DUDGEON. *Rep. of the Soc. for Study of Dis. in Child*, vol. vii., p. 56.
[14] CLEMENT LUCAS. *Brit. Journ. of Child Dis.*, February, 1908.

GANGRENOUS MAMMITIS OF SHEEP.

(A MILD OUTBREAK ASSOCIATED WITH A MICROCOCCUS EXTREMELY VIRULENT IN THE PURE STATE.)

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ALTHOUGH comparatively rare in New Zealand, this disease has on previous occasions come under the notice of the Department, one outbreak having been reported in 1903. The causal organism is a micrococcus originally discovered by Nocard, in France, where the disease is known as "udder disease," *araignée*, &c. The disease is also known in Great Britain under the popular designation "black udder," from the characteristic appearance of the affected vessel.

Description.

The following is a short description of the disease as generally observed: Death usually occurs in two to five days after illness is noticed, although cases of longer duration may occur. The udder is hard, hot, painful, and of a dark-red colour when first seen. Rapidly an œdematous condition spreads along the skin of the floor of the abdomen, and often down the thighs. The skin covering the udder is erysipelatous in appearance; it becomes darker and almost black in colour, and finally gangrene of portions sets in, the skin being readily detached over the portions of cold dead tissue. The milk is scanty, curdly, and often blood-tinged. The temperature is generally high. Emaciation and prostration proceed rapidly, and even very soon after the local lesion is observed general weakness is apparent.

In Europe, Nocard and others state the disease is probably frequently conveyed by the hand of the milker, but obviously that cannot be the medium here. Although Nocard failed to transmit the contagium by painting the teats of udders of healthy sheep with virulent cultures, nevertheless he considered the ordinary means of entrance is by the teat-duct.

Post-mortem Appearances.

The *post-mortem* appearances are as follows: The skin and subcutaneous tissue are infiltrated with a red-tinted œdematous fluid, and sometimes with gas-bubbles. The udder is dark-violet in colour, and infiltrated by a reddish serosity which distends the interstitial tissue. The milk contained in the reservoir and the large canal is coagulated. The inguinal (mammary lymphatic) glands are enlarged, infiltrated, and greyish-red on section. The viscera are engorged, the spleen is small and dark, the heart-muscle is often friable and pale. The muscles are pale, and infiltrated with small hæmorrhages. Microscopical examination of the udder shows the micrococci as a thick mass on the walls of the ducts and sinuses of the udder.

Cause.

The organism is a small diplococcus, found in great numbers in the milk. It stains by Gram's method, and grows readily in all media, with or without air. It liquefies gelatine, and curdles milk rapidly, rendering it strongly acid.

Experimentally, the goat, when the substance of the udder is inoculated, only develops a hard painful tumour, which disappears at the end of ten to fifteen days.

The horse, calf, pig, dog, cat, fowl, and guinea-pig are refractory to large doses. The rabbit develops a hot, painful swelling at the seat of inoculation, which ultimately becomes an abscess, the pus being full of cocci.

The ewe in milk can be readily infected with a small quantity of culture, or milk from an acute case introduced into the teat-canal, the result of which is rapid evolution of all the symptoms above described.

Such are the different features of the disease, as described by Nocard and others, and as we have found, both naturally and experimentally, in New Zealand. In the outbreak to be described, however, the natural disease was not so acute, although the specific coccus itself possessed greater virulence for most animals when inoculated in pure condition than has been recorded by other observers.

Symptoms.

Five pure-bred ewes on a Canterbury property were seen by Mr. Reakes and Mr. Neale, who found a condition of acute mastitis, with rise of temperature, disinclination to feed, &c. The udder was tense and somewhat swollen, and the milk was curdled, but there was no marked evidence of discoloration of the skin, or of gangrene or subcutaneous œdema. The animals had been affected for some days, but there was no typical symptom of gangrenous mammitis. Pipettes of udder secretion brought to the laboratory showed, on microscopical examination, numerous leucocytes, many of which contained diplococci, free diplococci and a large number of very small bacilli, which stained but comparatively faintly with any aniline dye, but (like the micrococci) were Gram-positive.

Culture media inoculated with the contents of the pipettes only developed pure colonies of the coccus. Even ordinary broth-tubes did not show any development of the short bacillus, which was evidently an an anaerobe, as it ultimately proved to be. The coccus in its appearance, mode of growth on media, &c., proved to be identical with that found in previous outbreaks of gangrenous mammitis in sheep, and with that described by Nocard.

Experiments.

In order to ascertain if the presence of the bacillus had any effect, two ewes of the same breed, each suckling a lamb, were chosen for experiment. One (No. 73) was inoculated with about $\frac{1}{10}$ c.c. of material from a pipette, the other (No. 74) with the same quantity of a pure broth culture of the diplococcus, in each case the material being mixed

with ten times the quantity of sterile broth, and carefully injected into the galactopherous sinus of the right half of the udder without injury to the mucous membrane.

The results were as follows: The right udder of No. 74 in twenty-hours was much swollen, hot, and painful; the secretion was curdly, and showed many cells with numerous cocci. In forty hours the gland was discoloured, but not intensely; swelling of the skin in front of the udder was observed; the animal was dull, moved very stiffly, and rumination had ceased. On the third day the swelling had increased, and was displacing the left udder, which, however, remained normal but for the appearance of many lymphocytes in the milk. The milk-secretion was deeply blood tinged, and very sparse in amount. The subcutaneous abdominal swelling extended forward for about 10 in., and was tense and hand. The animal walked with difficulty, and could not rise from the recumbent position without assistance. On the fourth day the udder was distinctly dark-violet in colour, the skin being necrosed and abraded. The abdominal swelling had spread forward to the axillæ, with discoloration of the skin. The udder secretion was deeply blood-tinged, and showed many degenerated cell-elements and groups of cocci. The animal exhibited great prostration. The temperature throughout fluctuated slightly, but had remained fairly constantly above 104° F. On the fifth day the animal, being *in extremis*, was slaughtered.

Post-mortem Examination.

In ewe No. 74, the subcutaneous tissue around the whole udder and extending forward to the elbow was infiltrated with much greenish-tinted but otherwise clear gelatinous exudate. The right udder was gangrenous towards the exterior, and especially the posterior half, the lobules having almost completely disappeared. The anterior part showed many hæmorrhagic areas, the tissues deeply inflamed, and infiltrated with greenish exudate, giving it a peculiar marbled appearance. The left udder was practically normal, but for the subcutaneous effusion.

Considering the small quantity of culture injected, the course of the disease was fairly rapid.

Ewe No. 73, inoculated with material containing many diplococci and bacilli, developed no marked evidence of mastitis. Three days after inoculation the udder was to all appearances normal, but careful examination detected a distinct hardness of the teat-duct. The milk-secretion was small and somewhat adhesive. Smears showed num-

erous lymphocytes and polynuclear leucocytes, with many bacilli and diplococci, numbers of each being englobed by phagocytes. This condition persisted until ten days after inoculation, when the animal was subjected to another experiment.

It was evident that this ewe (No. 73) either possessed some degree of immunity to the coccus, or that the presence and development of the bacillus inhibited in some way the growth or virulence of the coccus. Provided the latter were the correct position, it might be that some artificial immunity to the coccus in a state of purity had been acquired. To test this 0·1 c.c. broth culture of the coccus (subculture from sheep No. 74) was injected into the *left* and normal galactopherous sinus. The result was increase of temperature in twenty-four hours to 105·8° F., slight swelling in both udders, with increase of milk-flow. Forty-eight hours after inoculation the animal was prostrate, the whole udder was swollen, and violet in colour, while the skin of both thighs was also deeply congested. The secretion from the *right* side was now for the first time markedly altered, it being dirty-brownish in colour, and on microscopical examination showed masses of the short bacilli, with comparatively few cocci. The secretion from the left udder was also slightly brownish-red and curdled, and smears showed many pus-cells and masses of cocci in a state of apparent purity. Death occurred about sixty hours after the second inoculation—*i.e.*, of the pure culture into the left udder.

Post-mortem Appearances.

The skin of the udder, thighs, perineum, and in front of udder was of a deep livid, almost black tint. Both sides of the udder on section were dark and necrotic, the only difference being the presence of more subcutaneous and general œdema in the left than in the right. The spleen was enlarged and pulpy; liver and lungs ecchymosed; the left ventricle exhibited some subendocardial hæmorrhages and the presence of an *ante-mortem* clot, in which several groups of cocci were demonstrated. Microscopical examination of material from the udder showed, as before, some cocci, but chiefly bacilli in the right half, and only masses of cocci in the left.

In this case the second inoculation had first stimulated the general secretion, and then established acute inflammation in both udders simultaneously, and so probably overcame the inhibitory action of the bacilli, even though they also increased rapidly in numbers.

FURTHER EXPERIMENTS.

The bacillus in question was isolated and cultivated in broth anaerobically, it proving to be (as in milk) non-motile, staining with Gram, and forming but a slight turbidity in the media. Ewe No. 76 was inoculated with 0·01 c.c. of this culture, mixed with an equal quantity of coccus culture. The udder remained practically normal, but for a slight hardening of the teat duct and the appearance of leucocytes in the milk for a few days, after which no abnormality could be detected.

As a control ewe No. 75 was inoculated with the same quantity of a pure subculture of the coccus. The result in this case was a comparatively chronic purulent mastitis, the udder becoming slowly harder, lividity only appearing at the end of a week, after which the udder contracted in size, the secretion became serous, finally ceasing. This reaction was not typical, and was probably due to the fact that the lamb had been weaned for a week prior to the inoculation, and that lactation had almost ceased. Both ewe No. 75 and ewe No. 76 were, however, in the same stage of lactation—that is to say, they were almost "dry." No lactating ewes were available for further experiments.

The evidence points, therefore, strongly in the direction of the bacillus acting in a manner inhibitory to the coccus, and explains the atypical nature of the symptoms observed by Mr. Reakes in the naturally affected cases.

EFFECT OF THE COCCUS ON OTHER ANIMALS.

Rabbit No. 223 was inoculated with ½ c.c. broth culture subcutaneously. Death occurred in twenty hours. *Post-mortem* examination showed only slight blood extravasation under the skin of the thigh, but otherwise no abnormality. The coccus could only be isolated from the region of the inoculation.

Rabbit No. 224 was inoculated with a similar dose. In twenty hours the animal appeared prostrate, the ears were cold, there was œdema of the scrotum and the thigh, and profuse urination was marked. At twenty-eight hours the animal, being *in extremis*, was killed for examination. *Post mortem* showed no abnormality, except the slight œdema already noted and a distended bladder. Smears from the muscles of the thigh showed many cocci, but in the blood and elsewhere none could be detected, and they proved absent even in cultures.

Guinea-pigs Nos. 849 and 850, inoculated with ½ c.c. broth culture:

In twenty-four hours a large painful swelling developed, and this next day had extended to the scrotum. This gradually decreased, ultimately becoming localized as a walnut-sized, dense tumour, containing pus.

Lamb No. 82, inoculated in thigh with ½ c.c. broth culture: In twenty-four hours a painful swelling was present, and the animal was distinctly lame; temperature, 103·5° F. The swelling rapidly increased, and by the following day the œdema had infiltrated practically the whole of the subcutaneous tissue of the leg downward to the hoof; temperature, 105·8° F. The skin rapidly became discoloured, and by the fourth day necrotic patches appeared. The temperature on the third day was 106° F, and on the fourth had dropped to 105° F. Lameness had been intense throughout, and by the fifth day the limb was completely paralysed, being dragged by the animal when forced to move. Emaciation had been rapid, and food was refused. On the seventh day the lamb, being in a pitiable state, was killed. There was no pus at the region of inoculation, but below the necrosed skin, and extending down the thigh and covering the muscles, was a thick layer of adhesive exudate. The subcutaneous tissue below the hock was very œdematous. The muscles of the limb were pale and degenerated. Cocci were found in the adhesive exudate in the muscles and the subcutaneous œdema, but the blood proved sterile.

Lamb No. 83, inoculated with ½ c.c. broth culture: This animal was observed distinctly lame four hours after inoculation. In twenty hours the whole of the inner surface of the limb was œdematous from the groin to the toe; temperature, 104·6° F. The following day the animal was very weak, could only rise when assisted; both groins were swollen and very congested; the temperature remained the same. Death occurred forty-eight hours after inoculation.

Post Mortem.—Subcutaneous tissues of inoculated limb infiltrated with a large quantity of blood-tinged serous exudate; peritoneum deeply congested; kidneys congested and enlarged, each weighing 4 oz. There were numerous subcapsular hæmorrhages, and the capillaries of the cortex and medulla were intensely congested. The mucous membrane of the abomasum showed acute congestion, with submucous hæmorrhages, and the intestines were congested throughout. There were slight hæmorrhages under the capsule of the spleen. The liver was acutely congested. In the right ventricle of the heart subendocardial hæmorrhages were marked. All the lymph glands were markedly hyperæmic. Smears from the subcutaneous œdema alone showed cocci, and media inoculated proved this organism to be

present in a state of purity. No cocci could be isolated from the internal organs or the blood.

The lambs were about three months old.

These experiments demonstrate that the virulence of this coccus for all animals inoculated was much greater than is ordinarily exhibited by the microbe of gangrenous mammitis, as previously isolated here and elsewhere, provided it was employed in pure culture.

No experiments with cultures of the coccus and of the bacillus mixed together were conducted on animals other than sheep as described, chiefly owing to the fact that the investigation was conducted just as I was leaving the Department; in fact, the last observations were made by me after I had actually left the service. The whole circumstances seem, however, to be worth recording, and to indicate that some interesting results might be gained by pursuing investigations with mixed cultures in this and in other diseases.

DISEASES OF CANARIES.

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FROM Christchurch last summer a peculiar disease affecting certain aviaries in the city was reported by a noted breeder of prize birds, who forwarded the body of one for examination.

HISTORY.

The history supplied was meagre. For some days an affected bird would appear drowsy, disinclined to eat, and preferring to rest on the bottom of the cage rather than perch. There was no diarrhœa or other definite symptom exhibited. Death generally occurred within a few days of illness first being observed, but frequently no symptoms were noticed, and occasionally again the animal would linger for much longer than the average period.

POST-MORTEM APPEARANCES.

Post-mortem examination of the bird received disclosed no pathological condition further than a very enlarged and pulpy spleen, which measured an inch in length.

Microscopical examination of the blood and the spleen demonstrated some long sporulating bacilli and a number of short bacilli staining bipolarly. These were isolated: the former proved to be, as anticipated, putrefactive, and the latter was found to be pathogenic

for rabbits, guinea-pigs, mice, and pigeons, but not for ordinary fowls. Later on a cage was received from Christchurch containing three canaries; this was one of the cages in which a considerable mortality of canaries had occurred. It had been cleaned out, but probably not thoroughly disinfected. The three canaries sent in the cage had not been in contact with any diseased birds, nor in any premises where there had been a noticeable mortality. One was observed rather drowsy on arrival, but no other symptoms were exhibited. Next day the dulness had increased, while the respirations were slightly accelerated. This condition continued for twenty days after arrival, when the bird was found dead one morning in the cage. *Post mortem* exhibited nothing abnormal. There were a few bacilli in the blood, these being apparently similar to those previously isolated. That the bacillus was the same was proved by subsequent experiments.

Characteristics of Bacillus.

A facultative anaerobe, very irregular in length, varying from almost a coccus to the length of *Bacillus typhosus*, often in pairs, motile, staining bipolarly, and Gram-negative.

On agar the colonies are large, circular, with smooth edges and raised nipple-like centre, greyish-white and moist-looking. In streaks the growth is broad, raised in the middle, with fairly regular edges, which tend, however, to send off shoots.

On gelatine at 22° C. it grows readily, the appearance being similar to that on agar, but the edges of the growth are smooth. There is no liquefaction.

Broth (neutral) becomes rapidly cloudy, but no scum and little deposit is observed, the cloudiness being very uniform.

On serum the growth is not marked, and is not special. Milk is not curdled, although the bacillus grows readily in this medium, but being quite spherical in shape. Neutral-red is completely decolorized, in shake agars within forty-eight hours and in broth within twenty-four hours, the surface of the neutral-red broth showing a greenish-yellow tinge.

In glucose, saccharose, dulcite, and mannite media the growth is luxuriant. In the broth there is a very dense growth, much more opaque than an ordinary peptone broth. In the agar, as in shake cultures, there is evolution of gas, and a distinct alkaline reaction, especially with saccharose.

On potato there is a thin, almost invisible growth, which can only be demonstrated by scraping with the needle.

Indol is not formed. It will be noted, therefore, that the bacillus does not belong to the coli group.

EXPERIMENTS ON ANIMALS.

Fowls.—Two were inoculated, one being an old rooster, with 1 c.c. of broth; the other, a young, but adult fowl, with 0·5 c.c. Both remained normal, showing no swelling or evidence of discomfort.

Pigeons.—Five were inoculated with doses of broth culture varying from 0·25 to 0·5 c.c. Two which received 0·25 c.c. died within twenty-four hours; one which received 0·25 c.c. died in forty-eight hours; one receiving 0·5 c.c. died in forty-eight hours; and one receiving 0·25 c.c. in three days. *Post mortem* showed little swelling at the seat of inoculation beyond necrosis of the adjacent muscles, which were pale and friable. The internal organs were normal, but for the heart, which in the majority of cases showed blood extravasation of considerable extent around the auricles. Microscopical examination of material from the region of inoculation showed enormous numbers of bacilli, but the blood contained very few, frequently only one or two being visible in one field of the microscope.

Rabbits inoculated with broth cultures in doses of 0·5 c.c. and under succumb in from two to five days. There is little or no œdema at the seat of inoculation, but occasionally slight hæmorrhage subcutaneously. The muscles at the seat of inoculation are swollen and very pale. The internal organs are normal in appearance, the spleen sometimes only being slightly enlarged.

Guinea-pigs inoculated with 0·5 c.c. broth culture die in four to five days, the *post-mortem* appearances being similar to those of rabbits, with sometimes a caseous adhesive deposit underneath the skin at seat of inoculation.

Mice inoculated with one drop of broth culture succumb in four to five days, with little pathological change beyond slight œdema at the seat of inoculation, a small quantity of peritoneal effusion, and an enlarged and pulpy condition of the spleen. Microscopic examination shows many bacilli at the seat of inoculation and in the peritoneal fluid, but extremely few in the blood, spleen, and elsewhere.

Canaries.—One inoculated with one drop of broth culture exhibited no symptoms beyond a slight drowsiness during the last forty-eight hours of life, and was found dead on the morning of the fifth day. There was no swelling at the point of inoculation, but the adjacent muscles were pale and necrosed. Beyond a slight enlargement of the spleen, all internal organs were normal. Examinations of smears showed

numerous bacilli at the seat of inoculation, but extremely few in the blood and spleen—so few that rarely more than one or two could be observed in one field of a blood film.

Another canary, a very old bird, was inoculated with a similar dose, but beyond a passing dulness from which recovery was rapid no effect was observed.

Unfortunately, no further information could be obtained regarding the epidemic amongst the canaries, as those we secured were only sent about the end of the outbreak. There appears little doubt, however, about the contagious nature of the disease, and that the cause was the bacillus which proved so virulent for nearly all the animals inoculated, with the exception, curiously enough, of barnyard fowls.

THE NECESSITY FOR THE STANDARDIZATION AND STATE CONTROL OF VETERINARY SERA, AND BACTERIAL DIAGNOSTIC AND THERAPEUTICAL AGENTS.[1]

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.
Professor in the Royal Veterinary College, London.

Practically nothing has been done in the way of attempting to secure uniformity in the strength and preparation of the various biological products used for the diagnosis, cure, or prevention of infective diseases in animals. Consequently it is little to be wondered at that the use of those agents has not always been followed by the results that were expected, and that widely divergent results have been obtained by various practitioners. The object of this note is just to draw attention to the present state of affairs, and to suggest that it is advisable that steps should be taken by some competent authority to regulate the manufacture of those agents and to examine them from time to time to ensure that they are potent to produce the specific action of the respective agent.

The agents that come to one's mind principally in this connection are tuberculin, mallein, antitetanic serum, antistreptococcic serum, and blackleg vaccine. These, at any rate, are the chief bacterial preparations used by veterinary surgeons in the British Isles, and so, of course, appear to us as of the greatest importance. There are many manufacturers of these agents, and these manufacturers can place their products on the market without any guarantee of their efficacy.

In a congress such as this, where our chief concern is with matters relative to the public health, those agents necessarily claim special

[1] Read at the Congress of the Royal Institute of Public Health, Birkenhead.

attention that are connected with diseases transmissible to man, namely, tuberculin and mallein, agents used in the diagnosis of tuberculosis and glanders respectively. In any systematic attempt to eradicate these diseases, the diagnostic agents referred to will be, and are, called upon to play very important parts. Both diseases may be slow and insidious in their development, giving rise to little or no suspicion of their presence. In this condition they are frequently sources of real danger, and probably of even greater danger than the advanced and obviously diseased animals, because although the latter would no doubt be ejecting larger amounts of virulent material, their condition is readily observed and precautions can be taken against them, while in the other cases no danger is apprehended, and so no precautions against infection are taken. In fact, this is a common history obtained after human beings have become infected with that most fearful disease, glanders.

Hence it is that there should be no possible room to doubt the potency of the diagnostic agent, where failure may mean the death of an attendant from an incurable, and about the most loathsome, disease imaginable. And yet we are absolutely at the mercy of the manufacturer.

The failure of tuberculin may result in the distribution of tubercle bacilli in milk with perfect freedom. It may cause the retention of an affected animal in an otherwise perfectly healthy herd, and be a centre of infection for the rest. In such cases then, the assurance of the potency of the tuberculin is essential from the public health standpoint, from the farmer's standpoint, and from point of view of the veterinary surgeon using it, since his professional reputation may be at stake.

Failures in the efficacy of both mallein and tuberculin have been recorded, with a natural loss of confidence in their reliability as diagnostic agents. It is quite possible that those agriculturists who distrust tuberculin have some grounds for their distrust, not of properly prepared tuberculin, but of inferior products, or of old samples that may have lost their efficacy. One sometimes hears practitioners declare that they get more satisfactory results with one particular make of mallein, or of tuberculin, or of antitetanic serum, or blackleg vaccine. Such statements lack somewhat by their being rather indefinite, but they are begotten of practical experience.

Then, again, there should be some control over the indiscriminate sale of these products. Tuberculin, in particular, may lend itself to fraudulent use by dishonest dealers, some of whom have learned that repeated injections into a tuberculous animal may produce a temporary

immunity to its specific reaction. Hence the sale should be limited to veterinary surgeons.

I am not aware of any extensive or systematic examination of these agents as put on the market by different makers, with the exception of antitetanic serum. Various marketed samples of this agent, however, have been very carefully examined and standardized by Drs. Moller and Eichhorn, of the Bureau of Animal Industry of the United States of America, and they have discovered enormous variations. Taking the American unit as the standard of comparison, the immunizing dose for a horse being 1,500 American units, they found the necessary amount present in some manufacturers' products, but considerably less in others, while in one case there was actually less than one-third the required number of units to produce immunity.

This variation has been proved experimentally in connection with antitetanic serum, and I think we may safely take it as a fact that, in spite of the great difference in the method of preparation, a similar lack of uniformity in potency exists in many of the marketed samples of tuberculin and mallein, especially in the light of practical experience.

It is these variations then, and the disastrous effects that may result therefrom, that lead me to bring this matter forward, and to ask that some standard of uniformity should be fixed and enforced. It is not for me to suggest what standard shall be fixed in each case. A small committee of experts should be appointed to definitely fix a standard which should be zealously enforced. Moreover, they should determine the length of time the agents will with certainty retain their efficacy, and after which they should be withdrawn from the market as doubtful.

It seems to me that the authority that should take charge of the matter is the Board of Agriculture, as the agents referred to are veterinary in character; but, failing that authority, I would suggest the matter should be taken in hand by the authority whose duty it is to administer the "Food and Drugs Act," viz., the Local Government Board.

[After the paper had been read and discussed, the following resolution was proposed by Professor Wooldridge, and seconded by Mr. J. S. Lloyd, and was unanimously adopted: "In the opinion of the Section of Comparative Pathology and Veterinary Hygiene of this Congress, it is desirable in the interests of public health that standardization and state control should be instituted of the various biological products used for diagnostic and therapeutical purposes, such as tuberculin, mallein, antitetanic serum, and vaccines."]

Clinical Articles.

TWO CASES OF ACUTE LAMINITIS WITH FAVOURABLE TERMINATION UNDER ADRENALIN TREATMENT.

By C. H. HYLTON JOLLIFFE, F.R.C.V.S.
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Case 1.—The subject was a Household Cavalry troop-horse (gelding), aged 4.

The horse was under observation at the infirmary on account of slight urticaria, and on August 3 last, whilst being exercised, led, round the barrack yard, he slipped and fell on the near side. He got up and was apparently none the worse. The following day there was slight lameness on the near hind. This lameness increased on August 5 and 6, and on August 7 the horse was exceedingly lame and putting little or no weight on the limb. He was therefore placed in slings on this date. The lameness was referable to the hock, which showed some general diffuse swelling, heat, and tenderness to pressure around the joint. On the morning of August 8 the horse was found cast and badly entangled in the slings, having apparently tried to jump out of them during the night. On being released he subsided to the ground and was found to be unable to rise. The horse was then seen by Mr. G. H. Williams, M.R.C.V.S., who had the slings again placed under him and endeavoured to haul him up. The horse made, however, no effort whatever to stand, and it was found necessary to let him down. He fed well during the day, and about 4 p.m. he got up by himself with ease. He was seen again by Mr. Williams that evening, who found the horse up, but quite unable to move—"tied to the ground"—and he regarded the condition as one of acute laminitis affecting all four feet, and ordered the shoes to be removed as soon as the horse lay down.

On the morning of August 9, I saw the horse with Mr. Williams. He was then lying on his side, having laid down about midnight and remained so. The pulse was slightly voluminous, full, and frequent. Respiration accelerated; temperature 101·8° F. Further ineffectual attempts were made to get the horse up, and finally the slings were again placed under him. He was raised up with the chain and pulley-block into a standing position and his limbs placed vertically under him, but he resolutely declined to make the very slightest effort to stand, and hung limp in the slings, precisely as though he was com-

pletely paralyzed. He further gave no reaction to pin-pricks applied to the limbs, and the case had every appearance of one of complete general paralysis. There was, however, considerable heat in the feet and phalangeal regions, and very marked throbbing of the digital arteries all round.

The horse was now let down, and 1 c.c. of a 1 in 1,000 adrenalin solution was subcutaneously injected over the internal and external digital arteries at the level of the fetlock joint, both fore. He continued to feed well, in the prone position. About 4 p.m., he got up of his own accord, and when seen at 6 p.m. he was standing up, but practically immovable. His attitude was not the usual one of a horse affected with laminitis. He stood with all four feet well under him, and not particularly on the heels. He would frequently "paddle" with the hind feet. Aloes ʒvi. was administered.

August 10.—At 9.30 a.m. the horse was standing up. He was still more or less immovable, though less so than the previous evening and on the whole he appeared to show a slight degree of improvement. It appeared evident that the horse was affected with laminitis in the hind feet as well as in the front. It was therefore decided to inject adrenalin over the digital arteries of the hind limbs, but owing to the constant "paddling" and to the fact that the horse was incapable of standing on three legs with one held up, it was found impossible to carry out the injections with the horse in a standing position. It therefore became necessary to throw him, and whilst being "pushed" into position to adjust the hobbles he lay down of his own accord.

Adrenalin solution 2 c.c. of a 1 in 2,000 of normal saline was then injected on each side of all four limbs at the level of the fetlock joint (eight injections), and the horse was left lying down.

August 11.—The horse got up by himself early in the morning and could move more freely. He was purging, but fed well. Pulse and respiration showed improvement.

August 12.—Horse showed marked improvement. He could move comparatively easily, and when led out of his box he walked round the yard quite comfortably, though still evidently lame "all four." Pulse and respiration normal. Ordered ten minutes' walking exercise night and morning. Heat, pain, and swelling in the region of the near hock (referred to on August 7) had practically disappeared. Pulse and respiration normal.

August 16.—There was further improvement, and horse capable of trotting, though still lame all round. Increased local temperature

about the feet continued and there was no diminution in the throbbing of the digitals. There was some general œdema around the fetlocks. I ordered half an hour's walking exercise night and morning and wet swabs applied to the feet, and cold water bandages to the fetlocks and pasterns.

On August 19, there was further improvement and horse trotted quite easily, though he continued somewhat lame all round; 2 c.c. adrenalin solution 1 in 2,000 injected on each side of fetlock, all four (16 c.c.). Cold swabs, &c., and walking exercise were continued.

August 23.—Moved "short" all round and digital throbbing continued, though less pronounced. He was shod, and walking exercise increased to an hour night and morning.

August 28.—Except for moving slightly "short," the horse trotted practically sound.

September 19.—Horse was doing duty and action normal. Digital throbbing no longer apparent, and surface temperature of the feet normal.

The horse remains sound up to the time of writing (October 12).

CASE 2.—The subject was a black gelding of the same class as Case 1. The horse marched from Pirbright to London, a distance of about 30 miles, on July 14 last, and that evening showed marked signs of exhaustion. Temperature slightly raised, pulse disturbed, respiration accelerated, complete anorexia, &c. The horse spent the whole of the following day lying down, and the next day (16th), on being got up, was found to be showing typical signs of moderately acute laminitis, both fore. Shoes were removed and poultices applied. A purgative was administered, and the horse was exercised for half an hour twice in the day and kept loose in the box. On the 17th, the severity of the attack had slightly increased, and 4 c.c. of a 1 in 2,000 adrenalin chloride solution in aq. dest. were injected on each side of the fetlock, both fore. There was no perceptible change in the horse's condition that day.

On July 18 his condition was unchanged. Walking exercise continued.

On July 19 slight improvement was noticed and maintained.

July 23.—Considerable improvement. There was scarcely any lameness perceptible walking, and the horse could trot easily.

July 25.—Only slightly lame trotting, and progressing favourably in every respect.

July 31.—No lameness. Discharged, recovered, for duty.

CURIOUS FOREIGN BODY IN A HORSE.

By GEORGE D. MARTIN, M.R.C.V.S.
Westcliff-on-Sea.

Some little time ago a client of the writer, "thinking it might be of interest," as he said, brought to the surgery a glass tube with metal top, with the information that a horse which he had recently bought at a repository "had had a severe fit of coughing, during which he had coughed out this tube in one piece (it was brought to me in two pieces as at present) which broke on falling on the floor of the stable."

The tube in its whole state measured 10 in. in length and had a diameter of $\frac{7}{16}$ in.

I, of course, scouted the tale as an invention, but the client, a most reliable man and known to the writer for years, was quite hurt at this and averred that the facts were as above related. He, at the same time requested me to put in a tracheotomy tube for the horse which had delivered itself of the tube in question, which I did a few days later.

[Perhaps the horse in question, knowing his own infirmity and seeing the tube on the floor, had picked it up with the idea that he could so adjust it in his own trachea as to save his owner the veterinary surgeon's fee for tracheotomy! Really the intelligence of some roarers is wonderful!! This is only a suggestion, and our correspondence column will not be open for any discussion upon the point!—Ed. *V.J.*]

TWO CASES OF CONGENITAL TAILLESSNESS (PEROKORMUS ACAUDATUS).

By Staff Veterinary Surgeon SEIFFERT.

During last autumn manœuvres I had the opportunity of seeing a strong three-days-old calf which was born without a tail. It resembled the illustration of this peculiarity given in the surgery of Bayer and Frockner to the article by Dr. Th. Schmidt on "Diseases of the Tail." It also showed that there is truth in Schmidt's statement that malformations of the tail and cranial-cavity often co-exist. The left eye was completely missing in this case; the left eyelids were represented by a small cleft from which thin tears trickled. Palpation of the eyelids showed lack of the bulbus.

The second case was that of a circus stallion completely devoid of any trace of a tail. The croup was simply gradually rounded off; there was neither raising nor dropping of it nor any abnormal deviation of the direction of the hair announcing the place where the tail ought to be.

The hair was regularly grown, flat, glistening and gradually merging into the hairless skin of the upper half of the opening of the rectum.

(*Zeitschrift für Veterinärkunde.*)

Canine Clinical Notes.

NOTE ON A USEFUL METHOD FOR THE REMOVAL OF TEMPORARY CANINE TEETH.

By GEORGE D. MARTIN, M.R.C.V.S.
Westcliff-on-Sea.

EVERY practitioner with much canine work is no doubt familiar with the difficulty so often experienced in removing the temporary canine teeth in young dogs, and especially in those cases where the permanent tusks have nearly, or completely, erupted alongside them. Having tried all sorts of forceps and lancing the gums more or less severely, in my efforts to *pull* these teeth without breaking them and with so frequently disappointing results, I have for a considerable time now quite discarded forceps for the purpose, and my method is now as follows :—

Having secured the dog on the table with the hobbles, according to Hobday's method, in the ventral position, and administered either a general or local anæsthetic (local as a rule suffices), holding the patient's head with the opposite side to that about to be operated on and supported on a thickly folded cloth, the gum is freely incised with one long incision, following as nearly as may be judged, the anterior border of the root of the tooth to be removed, and extending quite down to and through the periosteum in all its length; then an ordinary bradawl of best quality (steel and $\frac{1}{12}$ in. wide at its cutting edge) is inserted in the incision just clear of the neck of the tooth—*i.e.*, level with the anterior border of the tooth and in the groove between it and the permanent tooth—using one's first finger on the instrument as a guard in case of slipping, and with a slightly boring side-to-side movement of the wrist the end of the bradawl is forced perpendicularly between the temporary and permanent teeth to a depth corresponding with one's estimate of the thickness of the tooth to be removed. When this is arrived at, the hand is lowered gradually, and the end of the bradawl in the same way, steadily, with the same boring motion, forced up towards the root of the tooth; one feels the tooth gradually loosen, and, when sufficiently so, the hand is raised and the tooth carefully levered out of its position. All that is necessary then is to grasp it with a pair of dressing forceps, and a slight twist is sufficient to free it from any gum attachment and to complete the removal. Hæmorrhage is sometimes fairly free for a few seconds, but soon ceases, and I have not had a single case of trouble from that cause.

TUBERCULOSIS IN A SCOTCH TERRIER.

By J. F. CRAIG, M.A., M.R.C.V.S.
Professor in the Royal Veterinary College, Dublin.

Subject.—Scotch terrier dog about three or four years old.

History.—About a fortnight or so previous to my examination it was noted that the abdomen of the dog began to increase in size, although the condition did not correspondingly improve.

Symptoms.—The condition of the dog was poor, the abdomen enormously swollen and tense, almost coming in contact with the ground. The mucous membranes were pallid, the temperature 101·8° F. The appetite and bowels were normal. On auscultation the heart-sounds seemed to be slightly muffled. The respirations were not markedly increased on raising the hind limbs. Palpation did not reveal any wave of fluid to indicate ascites. On manipulation a well-defined swelling could be made out, this swelling being in contact with the anterior portion of the abdominal floor. A laparotomy was advised and decided on. With the usual precautions and under general anæsthesia, the abdomen was opened along the floor from the xyphoid cartilage backwards. A large dark swelling at once presented itself, which was well defined and about as large as the human head. It was attached in front to the lower portion of the diaphragm and proved to be developed in connection with the liver. The attachment to the diaphragm was broken down, but in doing so an opening was made into the swelling, which proved to be an abscess, the contents of which escaped through the abdominal wound. The contents were clear, of a reddish colour and contained yellow flocules. The abscess then collapsed, the sides and posterior wall were removed. Further examination of the liver disclosed a number of large tubercles, and the case being one of tuberculosis, I had the animal destroyed by chloroform.

On *post-mortem* examination it was found that this large abscess had developed on the posterior surface of the right half of the liver, and its walls were yellowish-white in colour. Four smaller abscesses varying in size from a hazel-nut to an orange were present in the left lateral and middle lobes, and numerous small miliary tubercles were scattered through the liver tissue. The hepatic and mesenteric lymphatic glands were enlarged to about the size of walnuts and contained white caseopurulent centres. There was present also a tuberculous peritonitis. Numerous small granulations and tubercles ("grapes") were scattered over the great omentum, the mesentery, stomach, and intestines, and posterior surface of the diaphragm.

A small tubercle about the size of a pea was present in the cortex of the left kidney. The spleen was free from tubercles. In the thorax a little tuberculous pleurisy was noted, but chiefly near the foramen sinistrum over the diaphragm. The lungs were studded with miliary tubercles. Tubercles were also found in the left bronchial, two prepectoral, and one tracheal glands.

Tubercle bacilli were present in small numbers in films from the lesions.

Remarks.—The chief interest in this case arises from the large size of the tuberculous abscess in the liver and the symptoms shown resembling those of ascites. Tuberculosis is not uncommon in the dog, and one of the most common seats of the lesions is the liver; dropsy of the abdomen being a common sequel.

A "ZULU CURE" FOR DISTEMPER.

By GEORGE D. MARTIN, M.R.C.V.S.
Westcliff-on-Sea.

ONE day last spring I was consulted by a gentleman home on a visit from Zululand, regarding his dog, an Aberdeen terrier of about a year old, which he feared was developing distemper. An examination on my part cansed me to form the same opinion. Then the owner said he expected I should laugh and pooh-pooh what he was about to say, just as every other veterinary surgeon he had said the same to had done. However, I promised to listen with an open mind, and he then unfolded his tale.

In short, it amounted to this: that the Zulus believe the whole trouble in distemper is due to a worm in the under surface of the tongue which renders the tongue stiff and immovable, and thus causes inability to lap and to feed on the part of the dog, and that all the other symptoms result from this. The Zulus, my informant went on to say, are very expert in the removal of this so-called "worm," and he had seen many done and always with satisfactory results. Finally, he requested me to operated on his dog, the patient in question. After some considerable argument, in the course of which I endeavoured to convince him that the so-called worm was no worm at all, but merely what we call the median fibrous raphe of the tongue, and that it could not possibly exercise the influence attributed to it, &c., &c., my client was still quite unconvinced, and finally the question resolved itself into this: Would I do the operation for him? If I would not, having seen so many done in Zululand, he would try and do it himself.

Thus adjured I consented, and having anæsthetized the animal in the dorsal position, an assistant drew the tongue well forward and after wiping it free of mucus, spread it out carefully on a clean, dry cloth. I was surprised at the ease with which the raphe was removable, and at the very trifling hæmorrhage, and still more so at the result of the operation. The dog immediately on reaching home, one and a half to two hours after operation, ate his food with good appetite and to cut a long story short, from that day to this has never "looked back." All symptoms of distemper disappeared within two or three days and the dog required no further treatment at my hands! Though I have had many cases of distemper since that one, I confess I have not again tried that particular remedy. The fact remains that in this case no other treatment was attempted, that the dog absolutely refused all food and nourishment in any form before the operation, and after the operation appeared to forget all about having been ill. I do not attempt to explain the matter; I simply give the facts and the story as told to me, thinking it sufficiently curious to be of interest to readers of the Journal.

CUTANEOUS FILARIASIS IN A DOG.[1]

By S. N. MITTER.
Graduate, Bengal Veterinary College.
(From the Raymond Research Laboratory, Calcutta.)

On September 29 of last year, a Rampur hound was admitted into this College Hospital for treatment with the following clinical symptoms:—

Emaciation was very marked, and the animal was so weak that it could scarcely walk; there was a large patch of small pustules and ulcers, each surrounded by a hæmorrhagic zone, on the neck, extending downwards from which sero-sanious and sometimes sero-purulent fluid was discharged; the same kind of eruption was found on the hind legs. The dog also suffered from dysentery. The temperature and appetite were normal.

On examining, under the microscope, a drop of the fluid obtained by puncturing one of the fresh pustules, a small filarial embryo was discovered. The examination of some other pustules had the same result. A considerable number of similar parasites was also observed in the blood of the aural vein. In fresh specimens the embryos appeared as long, slender, translucent, apparently structureless,

[1] Reprinted from the *Journal of Tropical Veterinary Science.*

snakelike bodies wriggling about in the fluid in which they were found; the head was more or less rounded and slightly tapered; and the body was cylindrical and tapered gradually down to the point of the tail. The method of Sir Patrick Manson failed to demonstrate a sheath. This method consists mainly in preparing ordinary wet specimens of blood and then cooling them on ice for about eight hours; after removal from the ice the temperature rises, and the worm revives, and can be seen in the diffused hæmoglobin to be trying to break through his sheath. Under $\frac{1}{12}$ in. objective a fine transverse marking was observed in some preparations, especially at the caudal extremity. The mouth of the embryo was conical and showed no cephalic armature, but sometimes a small spine was seen protruding. The number of parasites in the different fluids varied considerably; in the pustules, one generally, but occasionally two worms were found; in a small drop of blood as many as five to ten specimens were seen. The examination of the fæces gave negative results.

In order to make a study of stained preparations, thick smears were dried in the air, the hæmoglobin was washed out with distilled water, and the specimen stained with weak solution of fuchsine, methylene blue, or hæmotoxylin and eosin. The embryo was then seen to be composed of closely packed granules of protoplasm. The length of the embryo was approximately 460 microns.

The local treatment consisted in applying tar and oil (1 to 40). The administration of creosote, bismuth, ipecacuanha and camphor cured the dysentery. General and nervine tonics were given during convalescence, and the animal was discharged quite cured on January 31, 1910.

An attempt was made to convey the disease by inoculation to a healthy dog, but without any results. Possibly an intermediate host is required, as pointed out in the observations on the metamorphosis of *Filaria nocturna* of man by Manson and of *F. recondita* of the dog by Grassi.

In *La Clinica Veterinaria* of 1906 there appeared from the pen of Dr. Dell'Aqua, a paper on "Canine Filariasis," in which he claimed to have found embryos of *F. immitis* in the liquid obtained from a fistulous ulcer in a skin affection of the fore and hind limbs of a dog which had been under treatment for two years; similar parasites were also discovered by him in the blood of the auricular vein.

"Cutaneous filariasis" in the dog has been observed by Rivolta, Siedamgrotzky, Moller, and others. There appears to be some

confusion about the biology of these parasites or possibly the disease is caused by different worms. Rivolta considers them to be embryos of *F. medinensis.* Siedamgrotzky is inclined to believe that they are *Anguillualæ* (strongyloids).

The line of treatment adopted by Rivolta was the application of mercurial ointment. Siedamgrotzky's dog was cured by general cleanliness. Dell'Aqua's treatment consisted in the local application of 1 per cent. sublimate solution. Calomel ointment, intramuscular and intravenous injections of bichlorate of quinine, produced negative results. The dog gradually recovered, and the embryos and the cutaneous lesions disappeared.

[In conjunction with this note it is interesting to read the translation on p. 687 of "verminous dermatitis," &c.—Ed. *V.J.*]

PAPILLARY EPITHELIOMA ON THE TONGUE OF A HORSE.

By Staff Veterinary Surgeon Dr. KETTNER.

In a horse belonging to the third squadron of the regiment of Westphalian Lancers the tongue had been frequently noticed hanging out from the right angle of the mouth during riding exercise. An examination of the mouth was undertaken in consequence and disclosed on the left side of the tongue at the level of the small ligament a flat tumour, as large as a pigeon's egg, which was united to the under surface by a firm stalk. The pedicle passing from the tumour at its upper surface joined the under surface of the mucous membrane of the tongue, and was continued into the tissue of the organ by a stem as thick as one's finger. The external surface of the tumour showed at its centre an irregularly-shaped portion of a greyish-red colour as big as a two-shilling piece; on the edges and turned-up surface of the tongue, the colour was yellowish-white to pure white. On the whole of the upper surface of the tumour there were punctiform hæmorrhages. The edges of the tumour were rough and uneven. The consistency of the neoplasm except at the coloured parts, was hard. On section the upper part was greyish-red to greyish-white, indistinctly wavy and stripy, the yellowish-white edges, on the contrary, resembled a divided citron enclosing greyish-white fields of yellowish-white stripes.—Weight 20 grm.

Treatment consisted in removal of the swelling by putting a ligature round the stalk, and cutting off of the remainder with the scissors—hæmorrhage was quite inconsiderable. The horse did not evince pain during the operation which was conducted without any restraint, the patient only moving his head.

Complete healing took place in ten days; there was no return of the complaint. No sticking out of the tongue occurred afterwards.

The tumour was examined at the laboratory of the Military Veterinary Academy, and pronounced to be a papillary epithelioma.

From a forensic point of view the case shows that hanging out of the tongue may be due to a tumour.

(*Zeitschrift fur Veterinärkunde.*)

Abstracts.

SOME CONSIDERATIONS ON THE PHENOMENA OF PARASITISM AMONGST PROTOZOA.[1]

By Professor E. A. MINCHIN, M.A., F.Z.S.

A living organism, whether plant or animal, which gains its livelihood at the expense of another organism is termed a parasite, and the organism at whose expense it lives is termed its host. The conception of parasitism, therefore, implies an antagonistic relationship between two correlated beings, parasite and host, each of which has, so to speak, its own point of view, the one attacking, the other defending. The phenomena of parasitism are of most widespread occurrence, and very varied in their nature. There is probably no species of non-parasitic organism which is not liable to the attacks of some parasite, and the same holds true even of a great number of parasites themselves, which are subject to be attacked in their turn by some other parasite.

The problems of parasitism are very complex, and are also very important, both from the more abstract point of view, as problems of natural history and bionomics, and also from the practical point of view, in their bearing upon questions of medical and veterinary science. In a brief space it is not possible to discuss all aspects and problems of parasitism, nor can such a discussion lay claim to any finality in the present state of our knowledge. I propose to lay before you a few facts of parasitism, restricting myself entirely to the field of the protozoa, and to consider the phenomena solely from the point of view of natural history; a method of treatment which, though it cannot claim to solve all difficulties, may serve nevertheless to furnish certain guiding principles, and to throw some light, if only a side-light, on the questions at issue.

Among protozoa, as is well known, many different modes of life occur. We are concerned here with those species which live constantly in association with some other organism of a distinct kind. Such a species may live either upon, or in, the organism with which it is associated; in the first case it is then termed *epizoic*, in the second *entozoic*. In all such cases of association, the species which are truly parasitic must be clearly distinguished from those which are not. Taking first the case of epizoic forms, it is found that in many cases they merely utilize the body of their host as a coign of vantage where they readily obtain their food, or as a convenient means of transport, especially when the epizoic form in question is of a sessile habit of life. Every naturalist is acquainted with the sea-anemones that live upon hermit-crabs, to the advantage probably of both animals, at all events to the detriment of neither. There are many similar cases amongst the protozoa. As every microscopist knows, the appendages of many crustacea, especially of cladocera, such as *Daphnia*, and copepoda, such as *Cyclops*, are often thickly beset with sessile vorticellids, or acinetans, which obtain a convenient lodging but provide

[1] Reprinted from the Journal of the Quekett Microscopical Club, by permission of the President (Professor Minchin) and Committee.

their own board. Other forms occur on the stems of hydroids, as for example *Acineta papillifera* on *Cordylophora lacustris* (Hickling Broad, Norfolk). The common *Hydra* often bears a beautiful infusorian which from its louse-like appearance has the name *Trichodina pediculus*, but which caters for itself and not at the expense of the *Hydra*. Amœbæ are to be found creeping on the exterior of calcareous sponges, nourishing themselves on diatoms and other organisms. Similar instances could be multiplied indefinitely of epizoic species which are merely commensals, and not parasites in any sense of the word.

On the other hand, epizoic forms may be parasites, and even dangerous parasites, nourishing themselves at the expense of the animal they infest, and sometimes inflicting much damage upon it. It can easily be understood that an epizoic form which at first lived harmlessly upon some animal, drawing its supplies of food from the surrounding medium, might acquire the habit ultimately of obtaining its nourishment from the living substratum upon which it has planted itself. Examples of truly parasitic epizoic forms are the flagellate *Costia necatrix* and the infusorian *Ichthyophthirius*, both of which live on the skin of fishes and injure the epidermis.

In like manner, there are many entozoic protozoa which inhabit the bodies, and more especially the intestines, of other animals, but which are not to be considered as true parasites; they simply feed on various substances to be found there, such as waste particles of food or fæcal matter, or on other organisms, such as bacteria—in short, on material which, from the point of view of the host, is superfluous or even noxious. Thus entozoic protozoa may be quite harmless, perhaps even useful as scavengers to their host; but such forms may also readily acquire truly parasitic habits and become a danger to their hosts. A good example of this is seen in the amœbæ found in the intestine of man. One species, *Amœba coli*, which occurs commonly in man in all countries, is believed to be a harmless entozoic form. In the Tropics, however, other species occur which find a more abundant source of nutrition in the living body which harbours them; they attack the epithelium and tissues of the intestine, devouring cells and blood-corpuscles and giving rise to a virulent form of dysentery; and they penetrate into the liver, where they destroy and corrode the tissues, producing most dangerous abscesses. It is often very difficult to draw the line between harmless and harmful entozoic protozoa, but all such organisms must be considered suspect, and it is the safest course from the practical point of view to hold them guilty until they have been proved innocent.

The entozoic protozoa which are truly parasitic are found inhabiting a variety of situations in the bodies of their hosts. In some cases the host is another species of protozoon, into the body of which the intruder penetrates, living either in its cytoplasm or its nucleus. Amœbæ are very subject to the attacks of intra-nuclear parasites, and the young stages of many acinetans are parasitic upon other infusoria. When the host is one of the metazoa, the invading organism may be, in like manner, intra-cellular or intra-nuclear in habitat; or it may penetrate into the tissues, living amongst and between the constituent cells; or, finally, it may be found in one of the internal cavities of the body, such as the digestive tract, body-cavity, blood or lymph-spaces, urinary organs, &c., either living free in the cavity or attached to

the lining epithelium. We may distinguish, in general, two ways in which these parasites may tax the resources of the host. Some of those living in the digestive tract may simply absorb the soluble products of digestion occurring there, thus diminishing the nutriment of the host by intercepting its food supply. Other parasites, in the digestive tract or elsewhere, ravage the very substance of the body of the host, either by devouring cells and tissues, as in the case of the dysenteric amœbæ already mentioned, or, and more usually, by absorbing the vital fluids and juices of the cells, tissues, or organs into which they penetrate, sapping in many cases the life-springs of the organism that harbours them.

As diverse as the modes of parasitism amongst protozoa are the effects they produce upon their hosts. Some forms of these parasites cause no perceptible disturbance in the well-being of the host; even when they destroy cells and portions of the tissues, the damage may be slight, and is quickly made good without appreciable harm being done to the host. From this condition of more or less perfect harmlessness there is a continuous gradation in the ascending scale of capacity for harmfulness possessed by protozoan parasites, culminating in species which bring about the death of their hosts with greater or less rapidity. Hence, parasitic protozoa are commonly characterized as pathogenic, that is to say disease-producing, and non-pathogenic; these two terms imply, however, a distinction which is purely relative, since a "disease" may be anything from a slight and transitory indisposition to a severe and fatal illness. Hence, in discussing these parasites it is better to group them as lethal, or deadly, and non-lethal, including under the latter term both harmless parasites and those that produce ailments from which the host recovers more or less easily. The distinction between lethal and non-lethal parasites is not, however, in all cases absolute, since a parasite which is ordinarily harmless or but slightly harmful may exhibit lethal powers under certain conditions, especially when the host is in an enfeebled state of vitality from other causes. For instance, it is common to see animals living in captivity succumb to the effects of parasites which are harmless to them when living a natural healthy life in their wild state. The weakened powers of resistance of the host enable the parasite to flourish in an abnormal manner, and give it a capacity for harmfulness which it does not possess naturally. Hard and fast distinctions between different classes of parasites, from the point of view of the effects on their hosts, cannot always be drawn.

The great diversity in the effects of Protozoan parasites is very remarkable, and furnishes a most important subject for consideration and investigation. It would seem, at first sight, as if the presence of even a single parasite must cause some bad effect in the body of the host, even if the disturbance be so slight as to produce no appreciable symptoms of ill-health in the organism as a whole. If so, then the greater the number of parasites in the body of the host, or the larger the parasite itself, the greater should be the derangement in the health of the host. Consequently, the greater the powers of multiplication within the body of the host possessed by any given parasite, the more dangerous it might be expected to be. To a certain extent this expectation is realized. Thus the gregarines of the suborder eugregarinæ, found commonly in the bodies of insects and

other arthropods, are amongst the most harmless of parasites, so far as can be judged, and in these forms endogenous multiplication, as it is called, that is to say, multiplication in the actively parasitic phase in the body of the host, does not take place. On the other hand, the parasites of the closely allied order coccidia, begin their cycle of development in the host by very active endogenous multiplication, overrunning some particular organ or tissue, and producing a sick and enfeebled condition which brings the host often to the verge of death, and sometimes even kills it. As a rule, however, animals attacked by coccidiosis, as the disease is termed, recover from the malady owing to the fact that when the host is brought very low, its condition appears to react on the parasite, with the result that the parasite ceases to multiply endogenously, and enters upon a different reproductive phase; it produces resistant stages destined to infest new hosts, in the form of cysts and spores, which are inactive and do not absorb nutriment, but pass out of the body of the host. In consequence the diseased animal loses its parasites, or the greater number of them, and the tissues are left in peace to regenerate and repair their injuries, provided they have not gone beyond the point at which recuperation is possible.

If the action and reaction of host and parasite were relations dependent simply on the number or bulk of parasites present in the body of a given host, the problems of parasitism would be comparatively simple. Examples can be brought forward to show that in many cases the effects produced by protozoan parasites cannot be explained, either by the number of parasites present or by the aggregate bulk of the parasites in proportion to that of the body of the host. The effect produced by a given species of parasite on a given species of host is a specific reaction, which differs markedly when one of the two factors is varied. It is not uncommon to find insects with their digestive tract or body cavity crammed with parasitic gregarines, of relatively large size, but causing no apparent inconvenience to the host. On the other hand, mammals may be be killed by minute organisms in scanty numbers. A better comparison is furnished by considering closely allied parasites and hosts respectively. A rat may have its blood swarming with *Trypanosoma lewisi*, without being apparently any the worse for it. On the other other hand, in a man dying of sleeping sickness, caused by *T. gambiense*, or in a ruminant dying of nagana (tsetse-fly disease), caused by *T. brucei*, the trypanosomes may be so scanty as to be exceedingly difficult to detect.[1] These facts strongly suggest, as has been pointed out by medical authorities, that the parasites produce a specific toxin. Only in a single case, however, has it been claimed that a toxin has been isolated from a protozoan parasite, namely, the "sarcocystine," produced by the parasites of the genus *Sarcocystis* (sarcosporidia).[2] The subject is one which remains to be investigated, and in the present state of knowledge it would be unprofitable to discuss it further here.

The interaction of host and parasite is a question of great practical

[1] Compare Laveran and Mesnil, "Trypanosomes and Trypanosomiases," translated by Nabarro (Baillière, Tindall and Cox, 1907), pp. 146-150.

[2] *Comptes Rendus Soc. Biol. Paris*, li. (1899), pp. 311-14.

importance, which in consequence has been studied chiefly from the medical standpoint—that is to say, from the point of view of the host. I propose here, as I have already said, to deal with the question as a naturalist, and to discuss the problem rather from the point of view of the parasite; and with this object I shall begin by a brief consideration of the facts of parasitism in general.

A parasite is, like any other living being, an organism struggling for existence in a hard and cruel world. The difficulties, however, against which a parasite has to contend, in the struggle for existence, are different in many respects from those which beset a free-living organism. When once a parasite has obtained a footing in its proper host, the question of food supply is solved for it, since it finds itself lodged in the midst of abundant nutrition so long as its host lives. On the other hand, if the species is to be maintained, it is essential that the offspring of the parasite should be able to infect new hosts—a matter usually of great difficulty, and one in which the chances are all against the parasite in most cases. To ensure dissemination of the species a large number of offspring must be produced, and special adaptations and mechanisms may be necessary. Hence in parasites, the more they become specialized and adapted to parasitic life, the more the organs and functions of nutrition tend to become simplified, and the greater the tendency to elaboration of the reproductive system. It is especially amongst parasites that we find the greatest complication in the structure and mechanisms of the generative organs, the most extraordinary and delicately adjusted adaptations of the propagative phases, and the most astonishing fertility.

So long as the parasite has not made the necessary provision for propagating its kind and disseminating its progeny, it is against its best interests to kill or greatly weaken its host. The interests of the two are bound up together, and the death of the host, before the parasite has completed its reproductive arrangements, necessarily entails the extinction of the parasite. The ideal host, from the point of view of the parasite, is one that is "tolerant,"—that is to say, one that can support the presence of the parasite and keep it supplied with the nutriment it requires, like a good mother or nurse, without suffering in health and vigour to any marked extent. When once, however, the parasite has matured and produced its reproductive phases, the life or death of the host may be a matter of indifference to it. In some cases the death of the host may even be necessary for the dissemination of the parasite.

From these general considerations it is seen that reproduction, and, above all, the dissemination of the progeny in a manner adapted to the special circumstances of its mode of life, are by far the most important functions of a parasite. Turning now to the special consideration of protozoan parasites, we find that diverse conditions of their mode of life and habitat impose a corresponding diversity in their reproductive phases and their modes of dissemination.

The passage of a parasite from one host to another includes two manœuvres, so to speak: the passing out from the first host, and the passing into the second. Primitively it may be supposed that this migration was affected simply by the unaided efforts of the parasite itself—that is to say, that the active motile parasite would force its way out of one host, move freely in the surrounding medium, and sooner or

later attack and penetrate a second host. This primitive method of transference doubtless occurs in many cases, especially amongst epizoic forms. In the case of entozoic forms its occurrence is more doubtful. It is very probable, however, that the spirochætes found infesting certain bivalve molluscs, such as *Spirochæta balbianii* of the oyster, and *S. anodontæ* of the pond-mussel, swim out of one mollusc and into another. Active migration of this kind, however, is very rare amongst entozoic parasites, if it occurs at all. In the first place the conditions of life within a living body, in the midst of organic fluids, are so different from those in the open water, whether salt or fresh, that it is hardly to be expected that a delicate unicellular organism adapted to the one mode of life could stand the sudden change to the other. In the second place, it is clear that active migration of parasitic protozoa could only be effected when the host is an aquatic animal, and not when it is a terrestrial organism. The only instances of active migration of entozoic parasites known with certainty are those in which the parasite can penetrate a mucous membrane, and is thus able to pass from one host to another when two such surfaces are in contact. In this way the trypanosome of dourine in horses (*T. equiperdum*) passes from one host to another during coitus, and the transmission of the parasite of syphilis is another instance.

Speaking generally, and excluding for the moment those cases in which the transmission is brought about by means of an intermediary host, the propagative phases of protozoan parasites take the form of inactive, resting stages in which the body of the parasite is protected against adverse external conditions by a tough protective membrane. In the form of resistant cysts or spores the parasites in a dormant state brave the rigours of the external world, and are able to withstand the heat and drought of summer, the cold and frost of winter. Like seeds they offer an inert resistance to the elements and are disseminated passively, and like seeds they germinate when they reach a suitable soil, but not till then.

Let us consider now the manner in which the first step in the propagation is effected, that is to say, how the propagative phases leave the body of the host.

Many, perhaps the majority of protozoan parasites occupy positions in the body of the host whence the propagative phases can pass without difficulty to the exterior. This is the case when the parasite is lodged in organs which have ducts or passages opening directly or indirectly to the exterior; for instance, in the digestive tract and its dependences, such as the liver, salivary glands, malpighian tubules of insects, &c.; or the urinary organs and ducts. In all such cases the propagative phases of the parasite pass harmlessly to the exterior. The host may in this manner get rid entirely of its parasites, without however necessarily acquiring immunity to fresh infections; or, on the other hand, the parasite may keep up its numbers in the host by "endogenous" multiplication while at the same time it is continually sending forth the propagative phases destined to infect new hosts. In the majority of protozoan parasites the relations to the host are of this type, and the parasites are neither lethal nor pathogenic to any great extent.

On the other hand, there are many instances in which protozoan parasites occupy a position in the body of the host whence escape by

anatomical channels is not possible, or if possible, not suitable. This is the case when the parasite inhabits some enclosed space in the body, such as the cœlome or general body-cavity, or the blood-system; or when it attacks deeply-seated cells or tissues of the body. In such cases there are at least six known methods whereby the parasite is disseminated or transferred to fresh hosts.

(1) The resistant stages of the parasite may be set free by the death and decay of its host. This appears to be the manner in which some of the tissue-infecting parasites of the order Myxosporidia, especially the family *Myxobolidæ*, are disseminated. These organisms are for the most part parasites of fishes, and are often very deadly in their effects.

(2) The parasite may cause tumours and ulcers, which suppurate and so set free the spores or cysts of the parasite. This again is an effect commonly produced by tissue-parasites such as the *Myxobolidæ*. In such cases the parasite is always pathogenic and frequently lethal to the host.

(3) The parasite remains in the host until the latter is eaten by some animal which preys upon it. The propagative phases of the parasite are able, however, to resist digestion by the animal that has devoured their former host, and pass unaltered through its intestine, to be finally cast out with the dejecta. This is almost certainly the method by which the common *Monocystis* of the earthworm infects its host. The parasite produces resistant spores in the worm; the worm is eaten by a bird, mole, frog, or some other animal, through the digestive tract of which the spores of the *Monocystis* pass unaltered; they are scattered abroad with the fæces, and may then be swallowed by another earthworm, in which they germinate and produce an infection.

(4) As in the last case, the host, together with its parasites, is devoured by some animal, in which, however, the parasite is not merely carried passively, but becomes again actively parasitic. Hence in this case there is an alteration of hosts, one of the two hosts becoming infected by devouring the other. This mode of infection, which is well known to be of frequent occurrence amongst certain parasitic worms, such as cestodes (tapeworms), is probably also frequent amongst protozoa; but at present only one case of it is known with certainty, that of the species of the genus *Aggregata*, parasites of crabs and of cephalopods, such as the cuttle fish and the octopus. In the cephalopod the parasite forms resistant spores which pass out with the fæces and may then be devoured by crabs; in the crab the spores germinate and give rise to a second form of the parasite which lives and multiplies in its new host. If, as frequently happens, the crab is devoured by a cephalopod, the parasite completes its life-cycle by becoming once more a parasite of the cephalopod.

(5) The protozoa parasitic in the blood of vertebrates are disseminated in all cases, apparently, by blood-sucking invertebrates, such as leeches, ticks, or insects, which take up the parasites by sucking the blood of an infected animal. Later on the parasite may be inoculated into a second vertebrate host by the bloodsucking invertebrate when it sucks blood at a later feed. In some cases the transference of the blood-parasite from one vertebrate host to another

may be effected in a purely mechanical manner by the invertebrate, but in most cases the invertebrate is a true host in which the parasite multiplies and goes through a cycle of development. Hence, in such cases also there is an alteration of hosts and a complicated life-cycle, which has been most completely studied in the case of the malarial parasites of man, transmitted by the agency of mosquitoes.

(6) In some cases the parasite may penetrate the ovary of its host, pass into the ova, and thus infect the embryo and the next generation of the host. Transmission of this kind is known in a certain number of cases: for instance, in the "pébrine" disease of silkworms caused by *Nosema bombycis*. It is never the sole method of transmission, but is always supplementary to other methods.

To turn now to the methods by which protozoan parasites penetrate into new hosts. We find four known methods, which can be summarized very briefly after what has been stated already. The commonest is the method of casual or contaminative infection, where the host infects itself by taking up the propagative phases of the parasite accidentally from its surroundings. Most usually infection takes place by way of the mouth, with the food; but it may be effected by the respiratory organs. Other modes of infection are the contagious, as in dourine already mentioned; the inoculative, as in malaria and other diseases caused by blood-parasites; and the so-called hereditary method, as in *N. bombycis* and other cases.

From the foregoing summary of the methods by which protozoan parasites are propagated and spread from one host to another, it is clearly seen that there are only very few cases in which it is of direct advantage to the parasite to cause the death of the host, and even then only when the propagative phases of the parasite are fully matured. In cases where the parasite is disseminated by its host being devoured by another animal, it is necessary for the propagation of the parasite that the host should die a violent death, but not through the agency of the parasite; on the contrary, the interests of the parasite are best served by the host remaining in good health until the fatal moment arrives, unless it be supposed that some weakening of the host renders it more liable to become the prey of its enemies. Blood-parasites, transmitted by the inoculative method, are not perceptibly benefited by the host's illness, and certainly not by its death. It is, however, very necessary for this method of dissemination that the required phases of the parasite should be sufficiently abundant in the blood to make sure of infecting the invertebrate that sucks the blood and transmits the parasite. To ensure this taking place it is essential that the parasite should multiply and swarm in the blood to an extent that may, in many cases, lead to pathogenic and even fatal results. Hence one interest of the parasite may, so to speak, clash with another, and the all-important object of dissemination cannot be attained without bringing about a state of affairs which puts an end to the host and to the parasite with it; a result which, though detrimental to the parasite, may not be seriously so, if the death of its host do not supervene until there has been time for the dissemination of the parasite to have taken place. No reasonable person, however, could expect any adaptation to be absolutely perfect.

The inevitable conclusion from a general consideration of the facts

of parasitism amongst protozoa is, therefore, that it is hardly ever to the advantage of the parasite to be pathogenic, and still less so to be lethal to its host. This conclusion is borne out by the facts, for when the known forms of protozoan parasites are reviewed and considered in their entirety, it is found that the vast majority of them are quite harmless to their hosts. Pathogenic and lethal parasites are the exception amongst the protozoa, and are greatly in the minority when compared with the harmless forms. The attention of investigators has been so much focussed on the disease-producing forms, on account of their practical importance, that they appear at first to overshadow the harmless forms which obtrude themselves less on the public attention, though far more numerous. Thus, if trypanosomes are mentioned, most people think at once of the deadly parasites of sleeping sickness or other diseases; and it come almost as shock to find that the fishes and frogs of our waters, and the wild birds and animals of this and other countries, are commonly infested with trypanosomes without being perceptibly the worse for these parasites. In fact, the disease-producing protozoa are to be considered as exceptional and aberrant forms; the effects they produce on their hosts are detrimental to their own interests, and they are instances of what has been termed by Metchnikoff a "disharmony" in nature. How is the existence of these lethal forms to be explained, and what is their significance? The best manner for a naturalist to attack this problem is to consider groups in which both harmful and harmless forms occur and are represented by closely allied species. Good instances of such cases are presented by the trypanosomes of mammals, of which two groups may be briefly described and discussed.

In rodents we find a group of trypanosomes of which *T. lewisi* may be taken as a type, and I shall therefore refer to them for short as the *lewisi* group. *T. lewisi* flourishes in the two common species of rats (*Mus decumanus* and *M. rattus*), but not in any other animal, not even in the mouse, which has its own peculiar species of trypanosome (*T. duttoni*). Similarly *T. cuniculi* is specific to the rabbit, and *T. rabinowitschi* to the hamster. All these four trypanosomes of rodents are, however, very similar in their appearance and morphological characters, and can scarcely be distinguished except by the physiological action and reaction between them and their hosts; there can be no doubt that they are closely allied species, differing only in that each is adapted constitutionally to parasitism upon a special host. These specific trypanosomes of rodents of the *lewisi* group are further quite harmless, under ordinary circumstances, to their hosts. When a rat becomes infected with *T. lewisi*, the trypanosomes at first multiply rapidly and swarm in the blood; then all multiplication ceases and the parasites gradually die out, after which the rat is immune to the parasite, and cannot be infected with it a second time.

Contrasting with the *lewisi* group is another which we may term the *brucei* group, the members of which are remarkable for their deadly powers, each species being the cause of some fatal disease. Such are *T. brucei*, the cause of nagana, or tsetse-fly disease in horses, cattle and dogs; *T. gambiense*, the cause of sleeping sickness in man; *T. evansi*, the cause of surra in horses: *T. equiperdum*, the cause of dourine in horses; and several other species. In this group also the parasites are practically indistinguishable from one another by appear-

ance or structure; the species can only be identified by their reactions, but this is much more difficult in the *brucei* group, since, unlike the *lewisi* group, the species are not limited to one particular type of host. Every member of the *brucei* group can flourish in a great many different hosts, though there are limits even to their powers of adaptability. Thus *T. brucei* can flourish in ruminants, dogs, rats, and many other mammals, but apparently not in man. *T. gambiense* can infect man, monkeys, dogs, rats, &c., but not ruminants. When a rat is infected by *T. brucei*, the infection runs a course quite different from that of *T. lewisi*. The parasites in the former case multiply indefinitely until the blood contains more trypanosomes than blood-corpuscles, and the multiplication of the parasite is only ended by the death of the host and with it of the parasites.

Comparing and contrasting these two groups of trypanosomes, it is impossible to avoid in the first place the conviction that in each group the species are closely allied, and descended from a common ancestor. The ancestor of the *lewisi* group had certain structural characters, distinguishing it from that of the *brucei* group, but each of these two ancestral species has given rise to a number of species which are practically indistinguishable by structural characters, and can only be differentiated by their physiological reactions. We have here a beautiful instance of species in the act of arising, and caught, so to speak, at a stage in which divergent physiological adaptation has not yet brought about structural differentiation. It is seen further that the species of the *lewisi* group are quite specific in their reactions, and are each limited to certain definite hosts, while those of the *brucei* group are far less specific, and are limited only to a comparatively wide range of hosts. We may reasonably regard the *lewisi* group as the further advanced in the evolution of specific characters, and the *brucei* group as being in a more incipient stage of specific differentiation. Finally, it is to be noted that the *lewisi* group are typical harmless parasites, while the *brucei* group are characteristically of the lethal type.

Further light is thrown on this question by a very interesting discovery made by Bruce with regard to *T. brucei*. He found that in districts where tsetse-fly disease was rife, *T. brucei* was to be found as a natural parasite of wild game, of which it is apparently as harmless as *T. lewisi* to rats. By the agency of tsetse-flies, *T. brucei* is taken up from its natural hosts, and inoculated into domesticated animals of various kinds, in which it flourishes, and to which it is extremely fatal. To the native races of domestic animals it is less deadly, but imported animals, new to the country, succumb rapidly. Thus the wild game acts as a "reservoir," from which the infection of *T. brucei* spreads to other animals.

From these facts it is seen that *T. brucei* is most harmless to those hosts in which it is a "natural" parasite, that is to say, in which there is what may be termed a racial adaptation of the hosts to the parasites, and which are constitutionally able to withstand the disease-producing powers of the parasite. On the other hand, it is most deadly to those races in which it is a new parasite, and which possesses no constitutional power of defence. The state of affairs is perfectly comparable to that seen in such a disease as measles, which is a comparatively harmless disease in Europeans, but an extremely

deadly disease amongst races in which it is freshly introduced. What is the precise nature of the mechanism of attack and defence is the fundamental problem of the researches on immunity which are now being conducted with such ardour and industry by pathologists all over the world, and which cannot be discussed now. The facts of parasitism indicate clearly, however, that when a race of hosts has been long associated with a race of parasites, the hosts gradually acquire constitutional powers of resistance to the parasite, which the hosts do not possess when first brought into relations with the parasite. Hence it may be said that a new parasite will generally be a dangerous one, though it does not necessarily follow that the converse is true, and that a dangerous parasite is always a new one.

Here it must be pointed out that there are two ways in which a given species of parasite is "new" to a species of host. On general grounds we must suppose that a parasitic organism of any kind is descended from ancestors which were not parasitic. Hence there must have been a period in the evolution of any parasite when its ancestors were first adapting themselves to parasitic life and establishing themselves in the body of their host, overcoming all resistance to their invasion. This kind of newness was probably not accompanied with lethal powers on the part of the parasite, since the capacity for reciprocal attack and defence on the part of the two organisms concerned was probably developed gradually in each organism and would tend to balance each other. The newness which is dangerous is seen where an organism with fully developed powers of parasitism in one "tolerant" host acquires the capacity for living in another host not adapted to. This consideration throws perhaps some light on the disease-producing powers of trypanosomes in general. From the known facts of the development of trypanosomes, it seems highly probable that they have in all cases two hosts, a vertebrate and invertebrate. There are further many considerations which indicate that they were originally parasites of the digestive tract of the invertebrate host. This view may explain why these flagellates are always perfectly harmless to the invertebrates, their "old" hosts, and only pathogenic to vertebrates, their "new" hosts.

Returning now to the consideration of the examples specially selected, it is seen that the harmlessness of the *lewisi* group is due to the fact that the species are specially adapted to certain hosts and cannot maintain themselves in any other but those particular hosts. On the other hand, the lethal powers of the *brucei* group are associated with the fact that its members, even when specially adapted to a "natural" host, can nevertheless establish themselves also in a wide range of "new" hosts, with fatal results to the latter. If I am right in regarding the *lewisi* group as further advanced in specific differentiation than the *brucei* group, it then becomes probable that the natural tendency of evolution is to bring about a balance in the profit and loss account of parasite and host, and that the species of pathogenic trypanosomes of the *brucei* group would tend in the future to become harmless parasites of certain hosts. The evolution, however, would be a long and gradual one, perhaps attained only by a painful process of natural selection of the hosts.

On the other hand, if I am right in regarding the members of the *brucei* group as newly-arisen species descended from a common

ancestral species of trypanosome, it follows that the ancestor must, through some process of variation, have developed the power of establishing itself in new hosts and invading, so to speak, fresh pastures. It may be supposed, therefore, that if this has happened once it may happen again, and that a parasite which is now specific to a single tolerant host may, by some unexplained process of variation, acquire at any time the power of infecting other hosts and so giving rise to new species of parasites ultimately. The facts of variation are at once the most patent and obvious characteristic of living beings, and the most difficult to trace to their causes; their study is of the utmost importance for understanding the evolution and the origin of species, and the phenomena of parasitism offer a field for the study of variation of a peculiar kind, that is to say, variation in physiological and constitutional than morphological characters. The variations in the powers of parasitic organisms are clearly of the greatest practical as well as theoretical importance, when it is seen that the spread of a parasite into new hosts is likely to be accompanied with the most deadly results to the hosts invaded by it. In fact, the origin of species amongst parasites is bound up with the question of the origin of disease. Ray Lankester has suggested [1] that the extinction of animals seen in past geological periods may have been in many cases due to their extirpation by some species of parasite new to them.

Thus it is seen that in the origin of species amongst parasites there are, as in other organisms, two steps: first the appearance of variations, with the resultant disharmony seen in the lethal forms; secondly, by a gradual process of reciprocal adaptation between host and parasite, the establishment of more normal harmonic relations, associated with definite specific characteristics and reactions on the part of the parasite and host.

OSTEOPOROSIS AFFECTING HORSES IN CEYLON.[2]

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The disease is also commonly known as Big Head, a term that at once calls to mind one of its most prominent symptoms. It is a constitutional disease occurring in both young and adult horses, characterized by stiffness and lameness, with enlargement, softening, loss of weight from absorption of earthy salts, and fragility of the bones, more especially those of the upper and lower jaw (hence the term Big Head). Any part of the bony framework may be affected, and such a bone as the shoulder blade may be enormously swollen with minor head symptoms. The disease is recorded in Ceylon, India, Singapore, Burmah, China, Australia, Africa, America, and Sandwich Islands. There is little reference to it in English or Continental veterinary literature, which indicates that the disease is not common there, but odd cases have been recorded. The geological formation of a country does not appear to have much influence. It is very common in the volcanic Sandwich Islands, and everyone is painfully aware of its

[1] *Quarterly Review*, No. 399 (July, 1904), p. 134.
[2] From the *Tropical Agriculturist.*

prevalence in this country (Ceylon), which is not volcanic, but formed of ancient crystalline rocks. Limestone occurs in localities, but is generally deficient. I believe cases occur in every part of Ceylon. This may be due to the fact that most horses are purchased in Colombo and taken to all parts. They also move about the country in the course of work, sale or exchange.

It is a common belief that damp districts are favourable and dry districts unfavourable to its development. All the time pony-breeding was carried on at Delft, as far as my connection goes with it, I never met a case. This refers to a point with reference to grain foods which I shall come to later. The ponies received no food other than the grazing obtained on the island. The soil is mainly sand, with broken coral and sea-shells, and so contains a good deal of lime. Our knowledge as to the true cause is very deficient. Many eminent men think it is principally due to dietetic, and others to climatic, influences. Some regard it as a bacterial disease and infective. This is hardly the occasion upon which to examine the various theories in detail, but as regards the climatic and dietetic theories it may be pointed out that the disease is well known under very diverse conditions of climate and diet, as will at once occur to you from the list of countries in which it is common. The bacterial cause has some very firm believers, especially W. Robertson, of Cape Colony, who has attempted its investigation, and says he considers it undoubtedly contagious, notwithstanding the fact that he was not able to find any organism in the blood or diseased tissues, or successful in communicating it from one animal to another by inoculation or feeding upon diseased tissues. He states that the presence of a sick animal may infect a stable, and a healthy animal put into such a stable may contract the disease. Professor Law, of Cornell, states that, in the opinion of several city veterinary surgeons, a fresh horse put into the stall of one that had suffered from osteoporosis soon contracted the disease. I am much in the same position as Mr. Robertson. I have studied the disease for many years, but have not yet succeeded in finding any organism or communicating the disease to another horse by experiment. If it is an infective disease, how infection is carried is at present a mystery. In the absence of any knowledge as to the true cause it is better to keep an open mind.

I have now to mention what is to my mind a very important matter, and the views expressed are supported by much of my own experience. Some time last year a paper was published by Mr. H. Ingle, late chief chemist of the Transvaal Department of Agriculture, who analyzed healthy and osteoporotic bones and certain of the foodstuffs of South Africa for the purpose. It is not necessary here to give figures and analyses in detail. The conclusion he arrived at is that the abnormal condition of the bones is favoured by the use of food not necessarily deficient in lime and phosphates, but in which the ratio of the lime (and perhaps the magnesia) to the phosphoric acid is too low. This would be the case when the diet is composed of cereals only, which contain a large percentage of phosphoric acid and low percentage of lime. He does not discard the bacterial theory, and points out that such a diet, if not actually causing osteoporosis, may cause such a condition of the system as to favour greatly infection by an organism. His suggestions are:—

(1) To avoid an exclusive diet of cereals.

(2) To give grass or lucerne hay.

(3) Where No. 2 cannot be done to add lime as calcium carbonate or bone meal to the food.

(4) To segregate an affected animal. Under No. 2 such food as lucerne, clover, meadow hay, cabbages should be added to oats, oat straw, maize, barley and bran, any of which are bad as an exclusive diet, especially bran. Paddy and gram also come under this class. Mr. Bruce, of the Ceylon Mounted Rifles, kindly analyzed samples of paddy and gram for me, and found that both are deficient in lime and rich in phosphoric acid, instead of being about equal. Paddy 100 phosphoric acid to 15 lime, gram 100 phosphoric acid to 50 lime, and bran 100 phosphoric acid to 9 lime, oat hay (average South African) 100 to 51—as compared with English lucerne 100 to 478, meadow hay 100 to 262.

This theory deserves working out thoroughly by experiment. Most of us know the good effects of turning a horse out to grass. I know very well the stiffness occasionally met with in horses fed exclusively on oats, and in which I invariably find a very acid reaction in the urine. Change of diet and a little saline medicine soon puts matters right. The condition is not osteoporosis, but it may be akin to it. As accessory causes dirty, unwholesome stables, careless management, overwork, and exposure to wet and cold in early life, predisposes to the disease, and most cases occur under seven years, but old horses are sometimes affected. Shetland ponies have a bad name, and the worst cases I have ever seen in Ceylon were a pair of Shetland ponies which were only in the island a few months. The symptoms vary a deal. The common statement of an owner is that the horse has rheumatism. The usual symptoms are stiffness, lameness, in one or more limbs often fugitive, shortness of action, stumbling and general slackness. The appetite is often indifferent, with sometimes a dislike of corn and a relish for grass or green food of any kind. The abdomen becomes tucked up, giving a pinched appearance to the loins, which are often very weak. As time goes on the enlargement of the face is noticed—in the superior and inferior maxillary bones. The enlargement of the superior maxilla appears as a swelling on either side of the nose below the eyes, which become in my experience more almond shaped. The lower jaw may be enormously enlarged, so much so that it may hardly be possible to get the fingers into the cleft between the right and left bones. The emaciation, stiffness, and exhaustion advance until the horse may absolutely collapse, and fracture one or more limbs or the spine. In some instances, without any very marked symptoms, a leg may suddenly fracture when the animal is exercised or worked. I have seen both hind legs of a coach-horse fractured when starting to pull the coach, and sudden accidents on the racecourse are not rare. A horse suffering from the disease may be in the very best of condition. In some cases the disease seems to be arrested at a certain stage, and the horse may work for years, showing only more or less stiffness.

Professor Law states that excess of phosphates in the urine indicates an active disease process, and decrease of phosphates cessation of the process, giving some hope of recovery. The course of the disease may be very rapid, and end fatally in two or three months; in

other cases it is slower, six months or a year, even two years, and, as mentioned before, a horse may remain useful for several years. As regards treatment, when the disease is well advanced, treatment is, in my opinion, waste of money. In cases where it is suspected to be developing, my usual plan is to change the feeding, administer salines and limewater in the drinking water, and improve the hygienic conditions generally. I am informed that in Australia it often attacks young racehorses when first put into training; as soon as it is suspected, they are at once turned out to grass and recover.

What concerns us more is prevention, and here the best management and care will be attended with the best results. The stable should be bright, airy, and dry and clean, with good drainage; if dark, half a dozen glass tiles on the roof will improve matters wonderfully. Avoid overfatigue and exposure to wet, and, if the horse gets wet, have him well dried as soon as possible, and not left in the stable to dry. Avoid the frequent washing common in this country. I have had the best results from the regular administration of limewater in the drinking water, which is very soft in many parts of Ceylon. It must, however, be a regular practice, and not given for a week and forgotten. It is easily and cheaply made by adding a handful of unslaked lime to a bucket full of water—stir up—allow it to settle, then pour off the clear water for use and bottle it, and as a general practice I give half a pint in each bucket of drinking water. Carbonate of lime or sterilized bone meal may be given in the food in small quantities. If Mr. Ingle's theory is correct, and I am inclined to think there is much in it worthy of further experiments, it will be advantageous to import into Ceylon English lucerne, clover, and meadow hay, and use it with the usual Ceylon ration and get a chemist to draw up the correct proportions of a mixture to give a properly balanced ration. I have no doubt the importers of horse foods will do it if there is any demand, and the cost will not be very different from that of the foods now used. Some legislation directed against the disease has been urged upon me by horse-owners in this country for some time. In the absence of definite knowledge of the cause it is difficult to know what measures will be of service. In deference to the wishes of many owners the disease has been included in the New Diseases of Animals Ordinance for the first time in any country, I believe, and the measures proposed, if agreed to by Government, will be on the following lines:—

(1) Power will be taken to destroy without compensation any horse, ass, or mule imported showing definite signs of osteoporosis.

(2) Every person having in his possession or under his charge any diseased or suspected animal must report it.

(3) Any horse, ass, or mule declared infected shall not be kept or exposed in any public stable, and if an affected animal is kept for work a separate stable shall be provided, isolated from other stables.

(4) Advanced cases shall be destroyed and carcase disposed of in the manner directed.

(5) A stable in which a diseased animal has been kept must be thoroughly cleaned and disinfected in the manner to be provided. Special attention given to the floor, which, if earth, will be removed entirely, and cement or other floor to be disinfected as directed.

Review.

PIGS, PIGSTIES, AND PORK. By E. Mayall, M.R.C.V.S. Pp. 204, with 55 illustrations in the text. Published by Messrs. Baillière, Tindall and Cox, London. Price 5s.

Books on the pig, its treatment in health and disease, have not occupied much of the attention of veterinary authors, and the little brochure by Mr. Mayall is especially likely to find a place on the bookshelf of the agriculturist who desires to be "up to date." It is intended to supply useful hints to the farmer who desires to make pig-breeding a useful and profitable addition to his yearly income. For the veterinary practitioner whose lot is cast in a country district the book will prove interesting reading, but the author does not dive deeply into abstract questions of pathology, nor does he pretend to have written a deep treatise on the treatment of disease. That in itself would fill a volume. Simple treatments are given, but no prescriptions, and the chapter on disease is really of a "first aid" character.

The chapters on breeding and feeding are useful, as is also the one on the hygiene and construction of the styes. There are hints on the inspection of the carcase, and we hope that when the book runs into a second edition this chapter and the one on diseases will be elaborated, or, better still, perhaps the author may be induced to write a book for the veterinarian on these subjects alone.

Personal.

MR. W. S. MULVEY, F.R.C.V.S., has been elected President of the Central Veterinary Society for the year 1910-11.

MR. T. S. PRICE, M.R.C.V.S., the retiring President of the Central Veterinary Society, has been elected President of the National Veterinary Society for 1911, in the place of Mr. W. Woods, F.R.C.V.S., who has resigned. We understand that next year's meeting will probably be held at Carnarvon at a date in July close to that chosen for the Investiture of the Prince of Wales at Carnarvon.

MAJOR-GENERAL PRINGLE has been gazetted Director-General of the Army Veterinary Department in succession to Major-General F. Smith, whose term of office has expired.

PROFESSOR GOFTON'S paper, printed in our issue of October, was read at a meeting of the Association of Veterinary Officers of Health at Glasgow.

Translations.

AN INTERESTING CASE OF URTICARIA IN THE DOG.

By KAITSITS.

During a walk in the street a watch dog, aged 6 months, was affected with a severe œdematous tumefaction of the whole of the head dewlop and upper part of the neck. The tumefaction was badly defined, not very hot, not painful nor depressible. Besides the skin of the sides of the neck and anterior limbs showed rounded nodules from the size of a lentil to that of a haricot bean.

After administration of bitters and friction with alcohol the dog was entirely cured the day following.

The animal partook habitually of different kinds of vegetables; it was supposed that the eruption was due to the action of some vegetable substance.

The author had already observed a similar case in a fox terrier, the ingestion of strawberries or chocolate regularly produced an attack of urticaria.

(*Revue Générale de Médecine Vétérinaire.*)

DERMATITIS VERMINOSA IN THE DOG.

By Veterinary-Surgeon LIEBERT.

Hanover.

At the beginning of May of this year a brown, short-haired, one-year-old German pointer, apparently suffering from mange, was brought to the clinic for treatment. On the outer surface of all four extremities and the breast-walls up to half the height of the breast there were isolated hairless places as big as a mark piece and in other parts greater areas which were confluent and without well-defined edges. The skin was reddened here and covered partly with grey scabs and partly with nodules about the size of the point of a needle. Between these places there were individual scabs, and flat, lentil-sized pustules filled with yellowish-green purulent contents. There was slight itching. The form of the illness had a great similarity to scab. In a series of microscopic preparations made from these parts of the skin acari could not be established. On the contrary in every preparation a number of round worms were found-of slender form and with pointed tail-ends which moved about very vigorously in glycerine preparations. They had all about the same size, showed no outline of generative organs and no genital differences. They were evidently a youthful form of round worm whose kind could not be declared. The worms were situated chiefly in the scabs and pustule contents. But they were also present in those parts of the skin covered with scales although it was necessary to scrape the skin in order to obtain them; superficially-situated scales covered no round worms.

According to a previous experience in the clinic these worms

gained access to the dog from the straw, but although the owner was asked to send some of the straw used as litter for the dog he omitted to comply with the request and therefore a decision as to the species of nematode could not be given.

Since these worms of the dog disappeared without treatment it was resolved to adopt only expectant treatment in this case, the skin of the dog being frequently examined for the worms. As, however, a whole rank of worms was found after a week the skin was rubbed with 1 in 1,000 sublimate spirit. In the course of a few days the patient was free from worms. To help the growth of hair the skin was later on rubbed with peruvian balsam spirit. At the wish of the owner the patient was discharged after the above treatment. The bald places were not then quite covered with hair.

A similar case has been recorded by Künnemann in 1905:—

The worms in this case were recognized as a youthful form of *Rhabditis strongyloides.* They dwell in foul substances and cause the above described conditions when taking up their abode on the dog. They are not parasitic on the canine skin and do not depend thereon for a life-cycle.

Leunke in 1909 tells of some dogs being affected with these worms. Four subjects were attacked. The worms seen by him were half the size of muscle trichinæ.

Siedamgrotzki describes another case in which he found youthful worms and female nematodes in the straw used as litter, but no male examples. Besides these cases only two others have been described in veterinary literature by Rivotta and Schneider.

(*Deutsche Tierärztliche Wochenschrift.*)

[This case is especially interesting read in conjunction with the Clinical note by Mr. Mitter on p. 668.—Ed. *V.J.*]

HAVE BONY SWELLINGS AN INFECTIOUS CAUSE?

By Army Veterinary Surgeon MAGNIN.
Versailles.

Nobody will deny that large synovitic swellings frequently occur from an infectious cause, and perhaps the time is not far distant when many bony growths may be attributed to the same cause. German veterinary surgeons, and notably Eberlein, have been making investigations in this matter for some time, but hitherto exact proof of such an occurrence has been wanting.

The case recorded here by the author points very forcibly to the possibility of an infectious cause of exostosis. If a certain number of extensive swellings of the joints and tendon sheaths are caused by an acute infectious synovitis, why should not hard ossifying swellings arise also in the same way if the course of the complaint becomes more chronic?

A five-year-old horse at the remount depot fell ill from infectious pneumonia, which was very prevalent at the time. Four weeks later a painful synovitis showed itself suddenly on the right hind limb at the fetlock joint. It was of a subacute character, and caused great filling of the joint. A month later a similar synovitis attacked the left hind fetlock without any external cause being known; a short

time later the lameness disappeared under treatment, but three weeks afterwards it suddenly returned. Very soon after this there arose on the joint a rather voluminous, wide, bony growth, and almost at the same time such another exostosis appeared in the hock joint. Both spavin-like swellings caused great lameness, which was plainly shown to be advancing. The lameness also disappeared in a short time in this case.

The attack was interesting because the osteitic processes did not appear to be due in any way to bodily strain, and could only be ascribed to the earlier illness. The horse shortly afterwards became convalescent, and was gradually put to work. This case alone does not, of course, prove much, but a similar one has not been met with by the author in an extensive practice.

(*Deutsche Tierärtzliche Wochenschrift.*)

PROLAPSUS ANI IN A HORSE.

By R. W. GANNETT.

A WELL-NOURISHED brown gelding, with prolapse of the anus, had been treated by Gannett for ten days. The extruded portion was shown as a big round tumour, very susceptible to the touch and bleeding easily. With great straining hard, dry, blood-stained balls of dung were passed.

The rectum was carefully emptied, and aloes given as an evacuant. The next day the whole prolapse was ligatured in three portions, a part of the healthy mucosa being included in the ligature. For four days the dung had to be manually removed. The ligatured portion gradually sloughed away. Healing of the rectum quickly followed without further treatment.

(*American Veterinary Review.*)

AUTO-ENTERECTOMY IN A BITCH.

(From the records of the Laboratory of Veterinary Physiology in the Cornell University.)

FISH records the following unique case: A two-year-old collie bitch was spayed in the median line. On the evening of the second day after the operation it was noticed that the wound sutures were gone, and two free ends of intestine protruded from the wound. After irrigation of the abdominal cavity with adrenalin chloride and careful cleansing of the intestinal ends and removal of their gangrenous portions union was performed by Lembert's sutures (with catgut), and replacement effected. The skin wound was also sutured.

Shortly after the operation retching, finally ending in vomiting, occurred. The vomit contained blood-clots and two pieces of intestine, one about 30 cm. and the other 26 cm. in length. The blood-clots doubtless arose in the abdominal cavity when the intestine was bitten through, and by swallowing the two parts of intestine they had arrived in the stomach.

The bitch died naturally after the reposition. On section, clots

of blood were found in the abdominal cavity. How is it possible to explain the occurrence? Fish inclines to the view that a carnivorous instinct or a desire for cleanliness induces the animal to eat all flesh material derived from its body (*e.g.*, afterbirth). Flesh-eaters are, as a rule, very clean about their abodes; this desire for cleanliness will best explain why these portions of bowel were eaten. Noteworthy logic in which, perhaps, Mr. Fish alone believes.

(*Deutsche Tierärztliche Wochenschrift.*)

CONCERNING SOME AFFECTIONS HAVING THEIR SITUATION IN THE SINUS.

By Professor HENDRICKX.

Brussels.

After having recalled the classic notions of purulent sinusitis, the author indicates a systematic original treatment. He describes, besides two other congenital affections of foals:—

(1) *Purulent Sinusitis.*—Primitive (traumatic) or symptomatic of neighbouring lesions, dental caries, gingival shrinking, or rhinites. Diagnosed by unilaterality of symptoms: fœtid discharge, indurated adenitis of the nasal cavity, conjunctivitis. The deformation of the region, rare if the discharge is abundant, may be accompanied by dyspnœa and wheezing, produced from the side of the internal wall corresponding to the nasal occlusion.

Treatment by antiseptic fumigations and external medicaments is only a loss of time; early trepaning causes quick modification of the mucosa; the hardened pus is extirpated with a curette at its mossy edges, and a first lavage (never on the recumbent subject) of 10 to 15 litres of water at town pressure, or with a large syringe, is given by the only orifice of trepanation, the return of the water being hindered by a tampon, and thus for some days until disappearance of the clots and fœtor.

Then antiseptic injections, varied every five or six days, transform the purulent secretion into a mucous one. Finally astringent injections dry up the secretion, and we can let the orifice of trepanation close. Sometimes cure is completed by total filling up of the sinus, caused by settling of polypiform structures due to myxomatous hypertrophy of the mucosa. If dental caries is a cause it is necessary to remove the molar and continue the injections until the alveolus is obliterated, otherwise applying a tampon of gutta-percha conveniently softened.

(2) *Retention of Normal Mucous Secretion.*—This is hydropsy of the sinus, cited by Cadiot and Almy as due to partial or total obliteration of the cleft of communication with the nasal fossæ. It is evinced in the course of the first year by an insidious deformation a ways accompanied by nasal wheezing, without discharge or glandular enlargement) always visible enough on account of the deformability of the bone, whose synarthroses have not yet become solidified.

Trepanation gives issue to an aqueous liquid. The mucous surface often presents calcareous precipitates in plaques or stalactites.

Treatment consists in injections at high pressure, until some drops

of the liquid pass out at the nose; then two to three days after communication will be re-established, and in a few months the region will retake its normal form by natural force.

Four times the author has not been able to obtain the passage of a single drop of water by the nose. Three subjects have been slaughtered; on the fourth he perforated the partition of the inferior maxillary sinus, but this orifice was rapidly obliterated by cicatrisation.

(3) *Gaseous Accumulation in the Sinus.*—In foals of a month old, through congenital malformation of the cleft which acts as a valve; the cold air inspired dilates at the temperature of the body and distends the sinus, whose osseous walls have not yet solidified. Deformation is then slower than in the case of the retention cyst. The gas causing this tympanism is never fœtid.

(*Revue Générale de Médecine Vétérinaire.*)

PENIS PENDICULUS IN A PIG.

By Veterinary Surgeon GRABE.

Wittstock.

Gaabe records a case of penis pendiculus in a pig. The pig was a well-shaped store, whose penis was plainly visible hanging loosely between his hind legs, and possessed a bean-sized glans with an opened-out urethra. The prepuce was of normal size and in the middle of the belly. The pig was castrated as a youngster, and possessed normal testicles.

SADDLE PRESSURE.

By Chief Veterinary Surgeon Dr. BACKMUND.

Dr. Vogt expressed the view that the causes of saddle pressure should be sought in pathologic anatomical changes of the vertebræ, and in 1909 Hauptmann, of the Field Artillery, controverted the idea that "in saddle pressure the obstinacy of the horse must be overcome," and from his investigations asserted that the horse with saddle pressure on the vertebræ has or has had periostitis or ostitis, causing changes in the bone of the vertebræ.

As a contribution to the clinical study of the matter, I recently came into possession of a very instructive lumbar vertebra preparation.

The bones were those of an old grey mare of the riding-horse type which had been killed on account of lameness of the hindhand. On section, as a cause of the lameness, melanotic growths extending from the anus to the psoal muscles were found, which had converted the latter into deep black tumour masses. At the same time exostoses were found on the lumbar vertebræ.

When the specimen had been boiled, the preparation as illustrated, was encountered. The fourth and fifth lumbar vertebræ were united by a bridge of bone, as big as a pigeon's egg, extending from the left

to the middle line, and anchylosing them. The edges of the bodies of the vertebræ, although remaining free, were covered with little bony protuberances.

A further formation of bone was visible between the right transverse processes of the fifth and sixth lumbar vertebræ, whilst these were anchylosed by a flat exostosis of 3 cm. long. The joint on the left side showed no bony union, but some osteophyte formation.

In this case we have a spondylitis deformans. By periosteal extuberances bony growths arose which bridged over the space between the vertebræ and thus caused anchylosis. In men similar changes in the vertebræ have been described (see Kaufmann, "Text-book of Pathological Anatomy").

The commencement of such a process is considered in human pathology to take place in the bodies of the vertebræ from the lessened elasticity of the vertebral ligaments, and leads to the characteristic bone formation which manifests itself by alteration of the old spongiosa and a bony clasping of the intervertebral ligaments, the exostoses not being caused by pressure but by concussion which the vertebræ deal with.

This view of saddle pressure will gain ground according as cases are investigated, and it will be found that such subjects must be looked at more from the pathogenic anatomical standpoint, and given up to the veterinary surgeon rather than the dresser.

(*Deutsche Tierärztliche Wochenschrift.*)

Books and Periodicals, &c., Received.

Pigs, Pigsties, and Pork, by G. Mayall, M.R.C.V.S.; Mr. E. Merck's Annual Report of Recent Advances in Pharmacy and Therapeutics; Proceedings of the Royal Society of Medicine, Journal of the Royal Army Medical Corps; Rhodesia Agricultural Journal; Agricultural Journal of the Cape of Good Hope; Tropical Agriculturist; Bureau of Animal Industry, U.S.A.; Department of Agriculture, Victoria (Government Certification of Stallions).

Letters and Communications, &c.

Mr. Chalmers; Colonel Raymond; Professor Craig; Captain Jolliffe; Mr. Mitter; Mr. G. D. Martin; Dr. Austin Peters; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland; Mr. F. J. Koch; Mr. R. Wilmot (Tasmania).

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

Letters for the JOURNAL, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editors.

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MAJOR GENERAL ROBERT PRINGLE, C.B., D.S.O., F.R.C.V.S.
Director-General of the Army Veterinary Service.
(See p. 722.)

THE

VETERINARY JOURNAL

DECEMBER, 1910.

Editorials.

"STRINGHALT" AND "SHIVERING."

ELSEWHERE in this issue of the VETERINARY JOURNAL we reproduce a paper on the above subject that was presented and discussed at the meeting of the National Veterinary Association this year. The paper was an excellent stimulus to a discussion which was characterized by the enormous amount of useful and interesting information it contained. Unfortunately, however, it is not possible for us to reproduce that discussion, and members of the National who were not present at the meeting should certainly read it through in their copy of the Proceedings that has been circulated to them. Undoubtedly when Professor McCall undertook the task of investigating these two affections he must have realized the difficulties he had to contend with, and it is not to be wondered at that up to the present he has not been able to elucidate the cause of the conditions or to discover any special lesions associated with them. As was to be expected, therefore, the discussion largely concerned the clinical aspects of the disease, and opinions of the various points were freely given by some of the most experienced members of the profession.

Perhaps the most important matter round which the discussion ranged was as to the intermittent character or otherwise of the affections. The consensus of opinion would appear to support the view that both conditions in mild or early cases may be, and not infrequently are, intermittent. Definite experiences supporting intermittence of stringhalt were related by Mr.

Spreull, Mr. Carter, and Mr. Shipley, while similar experiences of shivering, involving trouble for some of the relaters, were reported by such experienced and careful observers as Mr. Sheather, Mr. Hughes, Mr. A. Wilson, Mr. Sumner, and the President (Professor Macqueen). The latter authority expressed the opinion that "intermittent shivering is so common that no veterinary surgeon is to be held liable for overlooking its existence when the symptoms are not plainly to be seen." Mr. Villar seized the salient point concerning both affections and drove it home with the following summary: "It is a good thing we are able to lay it down that a man cannot be accused of making an absolute mistake because he has described a horse as a shiverer or affected with stringhalt, when other veterinary surgeons who have examined him have not found him affected with either of those diseases."

With regard to the cause, although no definite lesions could be described, it was generally accepted that both conditions are nervous in origin, that both may be hereditary, and that they may remain latent until the animal became affected with some debilitating disease or was subjected to considerable exhaustion. Casting for castration was discarded by all as being a negligible quantity if it existed at all as a cause, since both affections appear to be equally common in both sexes.

It is quite impossible to estimate the value of such discussions, and it is a great pity that more members of the profession do not avail themselves of the opportunities for learning that they offer. Even if they were unable to attend the meetings regularly they would be fully repaid for membership of the National, at any rate by receiving a full report of the proceedings in book form.

There is one great point which we think we should all learn from this discussion, viz., not to be too dogmatic as to the non-existence of certain affections, and especially so in legal cases. In certain possibly intermittent affections, a professional man may be warranted in saying he was unable even after a thorough examination to find any trace of the particular affection, but he is not justified in definitely stating that it does not exist. If this were to be borne in mind and acted upon there would be less distrust and pointing of the finger of scorn by both magistrates and laymen when "experts differ."

G. H. W.

MR. BARRETT AND THE FUTURE OF THE VETERINARY PROFESSION.

In these days of pessimism concerning the future welfare of the veterinary profession it is good to meet with optimism sometimes. The President of the Royal College of Veterinary Surgeons was certainly in an optimistic vein when he visited Glasgow to deliver the inaugural address at the Veterinary College in that city at the beginning of the present session.

It may be retorted that it is customary to be optimistic on such occasions. Be that as it may, we must bear in mind that Mr. Barrett has no axe to grind, and that he is in an anomalous position from which he should be able to survey dispassionately the ups and downs of the profession which he practised in his earlier days. Mr. Barrett does not believe that the time for the veterinary surgeon is past, and we decidedly agree with him. It is an old saying that "As one door closes another one opens." One door is certainly closing to us somewhat, though it will probably never quite close. That, of course, is due to the introduction of motor traction, which has considerably reduced the number of horses used in towns and cities. Mr. Barrett says the pessimists are chiefly men who have been most successful. Perhaps it is that they have the greatest reason for it. We know of one such city practitioner who during the last three years has lost from his contract list almost three thousand horses, which have been displaced by motors. He must have been successful to have held such contracts, yet who under the altered circumstances has greater reason for pessimism?

Fortunately, however, dairy cattle remain with us, and canine work is growing with leaps and bounds, while Municipal and State authorities "are alike beginning to realize the importance of veterinary science in relation to the questions of public health." It remains with us to realize the change, and to keep pace with it, yet we must not allow ourselves to be "side-tracked." We must not lose sight of the fact that our most important function as veterinary surgeons is still to assist in maintaining the health of the domesticated animals and to relieve them when affected by accident or disease.

Mr. Barrett's address, is both interesting and instructive, and well worthy of careful perusal. G. H. W.

General Articles.

"STRINGHALT" AND "SHIVERING."*

By JOHN R. McCALL, M.R.C.V.S.

Professor in the Veterinary College, Glasgow.

THE importance of these conditions and the scarcity of veterinary literature bearing upon them indicates that the time has come when an opportunity such as that presented by the annual meeting of our National Veterinary Association may with advantage be employed in a free discussion upon these obscure but highly interesting diseases. In this way, no doubt, many interesting observations may be recorded, and new facts brought to light which will assist us all in arriving at more definite conclusions than apparently exist at the present moment.

Stringhalt is the term used to define that peculiarity—spasmodic and excessively rapid flexion of one or both hind limbs, which occurs when the horse is made to move, best seen in the slower paces, and particularly in turning or backing. The limb is lifted abnormally high, but is able to support weight and allow of other movement in the ordinary way. This spastic movement is most marked when the animal is first exercised, and if this be continued the symptoms become modified, thus suggesting that a degree of accommodation becomes gradually established between the flexors and extensors of the limb.

The clinical history shows that the disease usually becomes manifest when the horse is put to work, it increases with age and hard labour, and any circumstance which tends to lower the vitality of the subject undoubtedly aggravates the symptoms, *e.g.*, an attack of influenza may make manifest a stringhalt hitherto unrecognized, which may, however, gradually disappear as the patient recovers strength. Excitement will also increase the symptoms, an example of which is frequently furnished in the Hackney Show ring. On the other hand, rest from hard labour has a modifying action, slight cases being difficult to detect after the animal has been laid off work for a few days.

The diagnosis of stringhalt in the early stages is usually an extremely difficult matter; we may suspect the horse, and subject

* Paper read at the meeting of the National Veterinary Association, London, 1910.

him to the most rigorous tests with negative results, yet, probably, were we to have the opportunity of examining him the next day we might have little difficulty in finding that he was affected. This intermittent nature of the malady is important, and should not be lost sight of in law cases where, naturally, the veterinarian is inclined to assume that because he is unable to detect any symptom of the disease, it is consequently non-existent.

If the condition is at all marked, then walking the animal and suddenly turning him to one side and then the other, or moving him backwards and forwards, as a rule causes the characteristic movements; likewise if the horse is made to move over suddenly in the stall he may "pick his hocks." If in doubt subject him to these tests on cobbled stones, because in my experience a slippery surface exaggerates the tendency, and more particularly when the horse is yoked. This applies equally to shivering.

There can be little doubt that stringhalt is most prevalent among heavy draft horses, although we encounter it in the hackney, thoroughbred, and other varieties; it also appears to be fairly common in the ass. At first sight its prevalence in draft horses might suggest that excessive muscular exertion played an important part in its production, especially when we remember that rest frequently modifies the complaint, but if excessive muscular exertion were the cause of the disease it would be of much more common occurence. Admittedly muscular exertion *intensifies* the malady, but probably its effect is limited to this.

The immediate cause of this interference with movement has been sought for in different organs, but up to the present has not been clearly demonstrated. Falke identified the condition with sciatica in man, but the clinical history is absolutely distinct, sciatica being a painful affection, the attitude being due to restriction of movement on account of pain.

Renner took it to be due to chronic inflammation of the ischiatic nerve, but this cannot be accepted, as chronic inflammation of nerves leads to structural alterations in their texture, and causes muscular alterations in their texture, and causes muscular atrophy, whereas in stringhalt, if muscular atrophy ever exists, except as a general emaciation, it is extremely rare, and, moreover, the microscopical examination of the ischiatic nerve fails to disclose structural alterations.

Boccar sought the cause in contraction of the peroneus, after discovering that the condition disappeared on section of this tendon; but this does not stand investigation, for section of the peroneus in many cases is of little or no avail, and even in those cases where it is beneficial it is frequently several weeks after the operation before full results are obtained; this would not be the case were the condition due to such a mechanical cause.

Bone spavin has been included in the list of causes of stringhalt, and while it is possible to have bony ankylosis of the tarsal joint interfering mechanically with the flexion and giving rise to a peculiar form of false stringhalt, this is obviously not the cause of true stringhalt, because in the vast majority of cases of bone spavin there is no stringhalt, and in nearly all the cases of stringhalt which I have examined no evidence of bone spavin could be detected.

Bassi attributes true stringhalt to interference with the movements of the patella. We certainly meet with cases of this description, but the peculiar jerky catch here observed occurs at regular intervals, and is frequently accompanied by a clicking sound, which differentiates this from true spastic stringhalt where the movement is more rapid and rhythmic.

Contraction of the fasciæ of the thigh, or the tensor fasciæ latæ, has been credited with causing stringhalt, but when section of the peroneus tendon fails to produce beneficial results, section of the fasciæ also fails, and those few who have practised this surgical treatment have been unable to report favourably upon it.

Stringhalt has also been identified with chorea minor of man, and with locomotor ataxy. It certainly resembles the former closely in the clonic nature of the spasms, but differs in that stronghalt is *strictly localized* to a certain group of muscles, whereas in human chorea the spastic condition is more generalized—the arms, limbs, and facial muscles frequently being involved, especially under excitement or observation. Stringhalt certainly differs from human locomotor ataxy, not being so much a want of co-ordination and irregularity in muscular movement as a clonic spasm of certain muscles; blindfolding the animal has not, in my experience, exaggerated the symptoms, nor interfered with the balancing power as it constantly does in locomotor ataxy of man. Furthermore, in the human subject sclerosis of the superior column of the spinal cord (*i.e.*, sensory) is practically constant, whereas this is not so in

stringhalt of the horse. Another diagnostic symptom of locomotor ataxy of man is the want of light reflexes, but although I have applied this test to many animals affected with stringhalt, I could never say that any marked departure from the normal could be observed, although the iris of the horse appears normally to respond much more slowly to the light than is the case in the human subject.

In a pamphlet on "Diseases of the Nervous System in Horses," by Chalmers Watson, M.B., M.R.C.P.E., published a few years ago, the author gives a brief description of the condition known in the human subject as lateral sclerosis or spastic paraplegia. To quote: "The clinical features are mainly motor, and comprise muscular weakness and a marked degree of spasticity in the gait. The affected limbs are raised in a spasmodic manner, and put down on the ground with a jerk that is often very striking, and not unlike the type of movement seen in aggravated cases of stringhalt in horses."

Certainly the clinical picture presents a remarkable similarity, but in spastic paraplegia the lateral columns of the spinal cord are invariably affected, and the lesion is a gross one; this has not been found to be the case in stringhalt in the horse.

The symptoms exhibited in true stringhalt indicate that the cause is due to irregularities in the functions of the antagonistic nerves of the lumbar and pelvic plexuses, but whether these irregularities are functional or dependent on structural changes has still to be elucidated.

Hereditary Aspect of the Disease.

Whatever difference of opinion may exist as to the etiology of this affection, the tendency for animals affected with stringhalt to transmit the disease to their offspring has been so long recognized by veterinarians that it is needless to enlarge upon it. Most of us whose vocation brings us in touch with breeding stock have seen many examples, and quite a number present to-day could mention cases of stallions well known in the show rings of Great Britain who are affected with this malady, and whose progeny are notorious for the same defect. It does not always follow that the disease is transmitted provided the dam is free from the defect, but still this is frequently observed. Where both parents are affected the hereditary tendency naturally becomes much aggravated, and this is common knowledge with breeders of horses. It is not usual for foals or year-

lings to show the complaint, still such cases have come under my observation, particularly in hackneys. This hereditary character of the disease is quite in keeping with allied nervous affections in the human family, and there can be little doubt that the hereditary transmission of stringhalt plays a most important part in the perpetuation of the malady.

When we consider to what an extent in-breeding is practised in most of our pedigreed stock, this aspect of the subject assumes even greater significance; breeding with a mare so affected is bad enough, but the results are confined to her limited offspring, whereas in the case of the stallion the effect is much more serious and far-reaching. Is it not time that the veterinary profession were bringing this fact prominently before the notice of the various agricultural and horse-breeding societies, and impressing upon these bodies the urgent necessity for examination of stallions destined for public service throughout the country? Already a few of the more enlightened and influential societies have grasped the situation and acted accordingly, and in the face of powerful opposition, but their example will require to become much more general before lasting benefit will result.

Legal Aspect.

In the case of Anderton *v.* Wright, reported in *The Veterinarian*, July, 1871, after hearing evidence the magistrate, Judge Greene, stated "it was perfectly clear that stringhalt constituted unsoundness," and found for the plaintiff with costs. In the case of Thompson *v.* Pattison, tried before Mr. Justice Cresswell, at the Liverpool Summer Assizes, 1846, his Lordship said "it is a question for the jury whether stringhalt produces those effects which in the eye of the law render him unsound," and in summing up shortly afterwards his Lordship said to the jury, "you have heard the evidence as to stringhalt; if you are satisfied that it is a disease calculated to impair the natural usefulness of the horse you must find for the plaintiff, it being admitted that the horse had it." The jury found for the plaintiff.

Results of Stringhalt.

As previously stated, this malady becomes worse with age and hard work, and few, if any, natural recoveries are recorded; still, the extent to which it advances varies considerably, some animals,

especially of the harness variety, appear to remain much the same for years, provided they are well fed and not overworked. The lorry horse who has to pull heavy loads on slippery streets with steep inclines yields to the malady much more quickly, and although in its initial stages the disease has little effect on his working capacity, the time comes when it undoubtedly impairs his value, incapacitating him from setting back and holding heavy loads coming down hill, and he then commences to break up. At this stage muscular atrophy becomes evident, but it appears to be a generalized condition rather than the local muscular atrophy indicating changes in the spinal cord anterior to their trophic centres.

CASE 1.—Female donkey (aged), in good condition, but badly affected with stringhalt, both hind. When first taken out of the stable the hocks were jerked up at every step, but after a few moments exercise the movements became less marked.

Tests Employed.—Blindfolding neither increased the movements nor caused stumbling. Eye reflexes apparently normal, sensation as demonstrated by pin pricks undiminished, myotatic irritability normal. Action of the bowels and bladder normal (thus showing that there was no interference with the vital reflexes in the lumbar region of the cord). Stroking of the panniculus caused twitchings.

Post-mortem Examination.—Naked eye. All the viscera appeared normal; the brain was exposed and removed, both it and the meninges appeared healthy; the pia arachnoid was delicate and transparent all over, and the blood vessels and sinuses apparently normal. The spinal cord was exposed in its entirety and removed; both it and its meninges showed no change. The median and sciatic nerves were excised, and to the naked eye were normal. The tendinous insertions of the peroneus, flexor metatarsi, and gastrocnemius muscles were also incised and removed for microscopic examination: to the naked eye they looked healthy. The various joints of the hind limbs were also healthy.

Microscopic examination of the brain, spinal cord, nerves and muscles, failed to reveal any pathological changes.

The following methods were employed:—

The nervous elements were stained (1) with Hæmolum and Van Gieson to show whether sclerosis was present; (2) by the Weigert-Pal method to show late degredation; and (3) by Marchi to show recent degeneration.

The muscles were stained with Hæmalum and Van Gieson, but showed nothing abnormal.

AUSTRALIAN STRINGHALT.

This disease, which in some respects resembles stringhalt in Great Britain, appears to be peculiar to Australia, where it affects large numbers of horses in certain districts. We are indebted to Professor W. T. Kendall, of the Melbourne Veterinary College, and Mr. Edward Stanley, F.R.C.V.S., for particulars of this malady. The following extracts and notes are made from veterinary reports furnished by them to the Minister of Agriculture for Victoria.

In 1865 or 1867 the disease appeared in Victoria; it seems to follow in the wake of Agriculture, and breaks out most frequently in paddocks which have been ploughed and then laid down to grass. As a rule it prevails in low-lying rich lands, and it always comes on suddenly without any assignable cause, and usually about the autumn.

Professor Kendall considers that the malady has three forms—namely, local, general, and acute general.

The local form is the most common and "is characterized by a peculiar jerking action in one or both hind limbs, which may be so slight as to be only noticeable when the animal is suddenly turned round or made to go backwards; but in more severe cases, both hind legs may be so badly affected that progression can only be accomplished by a succession of bounds and plunges extremely painful to witness." In cases where both legs are badly affected, when the horse desires to move forwards, the hind quarters are suddenly elevated, and one hind leg is violently jerked upwards, sometimes so high that the foot strikes the belly and remains so drawn up; the other is then brought up in a similar manner, the former being at the same time suddenly brought to the ground with great force. At other times both hind legs will be jerked up simultaneously, or in quick succession, and the hocks remained flexed to their utmost extent until the haunches almost reach the ground, before the horse has power to bring the feet down.

The appetite is almost invariably good, and the digestive and urinary organs appear to perform their functions properly. This form of the disease seldom proves fatal, and affected animals gradually recover without treatment in from twelve to eighteen months.

General Form.—The fore limbs are generally affected as well as the hind ones, but instead of being jerked up like the latter they are carried stiffly forward, the knee being scarcely bent at all. When undisturbed, a horse affected in this manner may graze and get about without much difficulty, but cannot get along at all when chased or excited, but begins to plunge and flounder about; some fall, and others after making violent struggles to get away, come to a sudden standstill, their heads being elevated and nostrils dilated. If near enough the heart may be heard beating violently.

Acute Form.—The symptoms differ considerably from those of either of the other forms, but as all three are found affecting different animals in the same mobs at the same time and under precisely similar circumstances, it is evident that they are only modifications of the same disease.

There is a dragging in all the limbs and frequent stumbling, the hind fetlocks knuckle over, and the thighs have a thin wasted appearance when viewed from behind. If the horse is made to move any distance he breaks into a perspiration. The attack is usually very sudden; should the horse fall or lie down he may be unable to rise, and struggles violently, but if raised by means of slings he can both stand and walk, and if properly attended to he usually recovers.

Treatment.—Change of pasture, as well as of locality, is one of the surest means not only of preventing the disease, but also for hastening recovery in those already affected. Medical treatment is of doubtful benefit.

Causes. — Eating of so-called dandelion, *Hypochœris radicata*, metallic poisoning from venadium, intestinal worms, rheumatism, ticks, and flies have all been credited with being responsible for the disease, but, upon close investigation, the evidence necessary to incriminate any one of these has been found wanting.

SHIVERING.

Shivering may be defined as an equine disease manifested by irregular and involuntary movements, generally of the hind quarters, accompanied by *tonic spasms* of certain groups of muscles, with marked difficulty or even inability to perform certain movements.

Symptoms.—In the early stages the disease is extremely difficult to detect. Beyond a suspicion of immobility and want of control over the muscles of the hind quarters when the animal is called upon to back, little else can be observed. Even these symptoms are

frequently intermittent and cannot be produced by the most severe tests. An average case of shivering may show no abnormality while the horse is walking quietly forward, but when excited, or suddenly called upon to stop, or set back, or to start forward when yoked, powerful tonic contraction of the gluteal and thigh muscles occurs, the horse arches his back and appears to grasp the ground with his hind limbs as if he were in danger of losing his equilibrium. If the hand be placed upon the gluteal and adductor muscles of the thigh while the horse is forcibly backed these will be felt to become rigid, and well-marked tremors can be seen as well as felt. The tail is frequently elevated and works somewhat in the manner of a pump handle, although the degree of elevation varies considerably in different cases. If turned quickly in a short circle the limbs move in a stiff inco-ordinate way, and in some cases excessive abduction and flexion of the thighs occur, and the pelvis sways in a peculiar manner. Any attempt to pick up the hind limbs meets with considerable opposition ; if successful in the attempt, the muscular tremors can be felt varying in intensity. This feature is frequently the premonitory symptom, hence the shoeing-smith is commonly the first individual to recognize the existence of the malady.

Many shiverers show decided symptoms when taken to the watering-trough, or better still when offered a pail of water on he ground. They become excited, and upon extending the neck muscular spasms seize the hind quarters, the fore feet remain implanted on the ground, the body sways backwards, the back is arched, and the tail jerked upwards. This behaviour, although typical of the disease, is not constant, as there are many bad shiverers that face the watering-trough without a tremor.

Acute Shivering.—This form is fortunately somewhat rare ; still, occasionally such cases are encountered, and many terminate fatally in a few hours. I have in my mind at the moment an interesting case. A contractor purchased a lorry horse at a sale, warranted a good worker, but, on yoking him, was suspicious that he was a shiverer. The horse was sent a journey of nine miles with a light load, and on the return journey had to bring back a heavy load of sand. The weather was hot and the road hilly ; before he had gone far on the return journey the muscular spasms became greatly aggravated, he got highly excited, and broke out into profuse perspiration. Notwithstanding these symptoms, the driver continued on the journey

until the horse came to a complete standstill, and had to be unyoked. His distress and excitement were painful to witness ; he showed spasms of the muscles of the hind quarters, fore limbs, and neck, while the lips, ears, and eyelids twitched convulsively, and he swayed on his legs. He was returned to the seller, but died the same night.

Debilitating diseases, more especially influenza, frequently cause marked aggravation of the disease, the animal in some cases being hardly able to come out of the stable, but as convalescence proceeds these symptoms usually disappear. A sudden fright or shock may also produce marked symptoms of shivering in a horse which hitherto has appeared free from the affection : thus a railway journey has been known to develop latent cases of the disease, and I have known street accidents to have a similar effect. These facts are quite in keeping with like experiences in the human subject, as for example terror, shock or grief precipitating latent insanity, chorea, or other nervous affections. It is, however, recognized that such causes are not sufficient in themselves to produce the disease without a previous susceptibility, which is often markedly hereditary. Docking the tail has been credited with similar effects, probably the nervous shock and subsequent hæmorrhage being here the exciting cause. Cases of shivering are occasionally encountered where the forelimbs are also involved, the knee is not freely flexed, and on attempting to pick up the fore-leg the horse extends it in front of him like a prop, resisting any attempt at knee flexion. When we do succeed in bending the limb, distinct tremors can be felt which exactly resemble the spasms in the hind limb of a typical shiverer. In severe cases of shivering we may meet with muscular spasms of the neck, lips and eyelids, which can be observed when the horse is forcibly backed on a slippery surface, or otherwise excited. The nervous temperament of shiverers frequently shows a peculiar irritability and want of uniformity, one day he works quietly, even sluggishly, the next he is quick, nervous, and excitable ; he may absolutely refuse to do certain work, but on being put to another occupation for a few days he returns to the former job apparently much benefited by the change. Some of these facts would suggest that in such cases the brain, as well as the spinal cord, is implicated in the disease. We have an analogy in the human subject where irritability, emotional excitement, and deficiency in will power (*i.e.*, facile) are frequently associated with diseased conditions where if structural changes occur

they are strictly localized to the spinal cord. This is not to be wondered at when we reflect how intimate is the relationship existing between the various branches of the nervous system.

Causes of the Disease.—In almost all cases shivering runs a chronic course, is incurable, and gets worse with age, hence it is an extremely grave unsoundness; hard work, deficient feeding, and heavy carting on the slippery streets of hilly towns tend to aggravate it. Although the malady is not infrequent in farm horses, they appear to last much longer.

PREDISPOSITION AND CAUSES.

Hereditary predisposition is undoubtedly a strong factor in the production of this disease. It is met with most commonly in heavy draft horses, but occurs frequently in the lighter breeds. It usually affects horses when they are put to work, but cases have been observed in young stock that have never been handled. It is said to be more prevalent in Scotland than elsewhere, but this is a matter of opinion, certainly it is not uncommon south of the Tweed.

Apart from the hereditary nature of the disease there is not much actually known as to its cause, and it is remarkable how little has been written on this subject, some of our standard works containing no reference whatever to the disease. The term "shivering" is much more appropriate than chorea, because the tonic spasms of so-called equine chorea are perfectly distinct from the clonic spasms of chorea minor of man or of the dog. Shivering has been compared to locomotor ataxy of man, but close inspection shows that they are distinct, the definite lesion of sclerosis of the superior column (*i.e.*, sensory) of the spinal cord being absent. Blindfolding does not exaggerate the symptoms, nor does it interfere with balancing, neither do the eye reflexes appear to be affected, all of which are typical symptoms of human locomotor ataxy. In the pamphlet on "Diseases of the Nervous System of the Horse" (previously referred to under Stringhalt) Dr. Chalmers Watson reports in detail a case of shivering in the horse in which the stifle joints were both enlarged, and from his description evidently the seat of chronic ulcerative arthritis; he compares the appearances with tabes dorsalis in man—*i.e.*, locomotor ataxy, and concludes that the peculiar joint lesions were neuroptic in origin. It will be interesting to learn from the discussion if veterinarians have observed any connection between stifle joint disease and shivering; personally I regard the conditions as pathologically quite distinct, although they may exist conjointly.

Diagnosis.

There are few duties so unsatisfactory as the examination of suspected cases of shivering, and so long as the disease retains its intermittent character we will have differences of opinion existing, and contradictory evidence in courts of law. We may back the horse, and turn him either in the hand or in harness, pick up the hind limbs and apply the hammer smartly to the shoes, or test him in the stall or at the watering trough with negative results, yet were we to be present when he rises from slumber we might be surprised to notice the rigid position he assumes, the hard tense state of the muscular system, and in some cases the absolute difficulty experienced in standing steadily until the muscular mechanism accomodates itself to the altered position. Some bad shiverers, when they first rise in the morning, present an appearance not unlike the acute stage of tetanus.

Case 2.—Grey harness gelding, six years old, 14 hands high, badly affected with shivering, involving both the fore and hind limbs. Has been in the possession of the present owner for eighteen months, during which time he has become gradually worse, although he is still fit for moderate work. He has a dull look, is sulky, and inclined to bite in the stable. He walks and turns in a very stiff, tetanic-like manner, and when forced back the tail was freely elevated and arched over the back ; he does not flex either the hocks or knees to any extent, but appear to hold on to the ground and drags his limbs. Sensation from the loins backwards over the gluteal region defective, but from the stifle down appears increased, and he kicks out on being pricked. Great difficulty is experienced in picking up either the fore or hind limbs, and the peculiar muscular tremors are very evident *when any one of these* are forcibly held, or the shoes tapped with the hammer. He can drink from a pail on the ground with ease, although the tail becomes elevated and spasms of the thigh muscles well marked.

Tests.—Blindfolding has no appreciable effect in aggravating the symptoms, nor does it cause any stumbling or interference with balancing. The reflex action of the iris to light appears normal. Myotatic irritability (*i.e.*, tendon reflexes) apparently increased. Stroking the panniculus causes exaggerated twitching. The action of the bowels and bladder are normal, but he shows difficulty in assuming the attitude for micturition, and groans during the act.

Post-mortem Examination.—All the organs appeared normal with

the exception of the kidneys, which were somewhat paler than usual, and the heart which was hypertrophied, weighing 9½ lb., the muscular fibres appeared healthy, but the mitral valves were thickened and somewhat fibroid. All the joints were normal.

The brain and spinal cord were exposed, and there was some congestion of the latter.

Sections of the brain and cord were stained with hæmalum and Van Gieson, also by Weigert-Pal, Marchi and Nissl's methylene blue method, but no abnormality could be detected. The superior nerve roots were also microscopically examined after staining with Hæmalum and Van Gieson and by Nissl's method, but they also presented a normal appearance.

Remarks.

It will be observed from the foregoing notes on the *post-mortem* examinations of the donkey and harness cob affected with stringhalt and shivering respectively, that the microscopic investigation of the nervous and muscular tissues failed to reveal any definite structural lesions, so far as it was possible to ascertain by the most approved, thorough and recent methods. While these results appear disappointing they undoubtedly tend to disprove that *certain definite structural changes* hitherto recorded can be the essential cause of these diseases. Such absence of recognizable structural lesions, however, is not confined to equine shivering and stringhalt, as many grave nervous diseases in the human family, *e.g.*, chorea, epilepsy and even old-standing cases of insanity, have up to the present time remained unidentified with any definite lesions. Of recent years the theory of the *toxic origin* of many nervous affections has steadily been gaining ground, the symptoms exhibited being attributed to toxins present in the body acting upon the central nervous system, and the liability to such intoxication being distinctly hereditary. Little is known, however, regarding the nature of these toxins or whether they are formed as a result of faulty metabolism, or perverted secretions.

When we review the whole circumstances of Australian stringhalt, as recorded by Keddall, they appear to strongly support the toxic theory.

In conclusion, I desire to express my gratitude to Dr. Ivy McKenzie, M.D., Director, Western Asylums Research Institute, Glasgow, and Dr. Robert Macnab Marshall, M.D., Senior Assistant

Physician, Royal Asylum, Gartnavel, Glasgow, who are responsible for the microscopic part of the work, for the enthusiasm with which they interested themselves in the subject, and for the painstaking manner in which they carried out the intricate duties of the research.

LITERATURE CONSULTED.

MOLLER AND DOLLAR. "The Practice of Veterinary Surgery."
OLIPHANT. "Law of Horses."
HAYES. "Veterinary Notes for Horse Owners."
CHALMERS WATSON, M.D. "Diseases of the Nervous System of Horses.'

TWO SHEEP DISEASES.

BY STEWART STOCKMAN, M.R.C.V.S.[1]

(1) THE CRUELS.

THIS is a disease which seems to be fairly prevalent on certain farms in Scotland. Attention was particularly called to it owing to its appearance amongst a lot of ewes which had been brought as lambs from Scotland to the South of England, four of which were sent to the Board's laboratory by the owner.

The disease is characterized by sores on the lips, swelling of the face, and the appearance of cold abscesses along the course of the lymphatic vessels. Apparently the disease begins in the neighbourhood of the lips. The abscesses vary in size from a pea to a small walnut, in bad cases they extend down the lymphatics of the neck, and they may be found in the substance of the lungs. The contents of these abscesses is not like ordinary pus. The material is of a pale yellow colour, rather waxy in appearance, and very glutinous in consistence.

The disease does not appear to affect very seriously the general health of the sheep until the lungs become invaded, or unless the site of the multiple abscesses interferes with swallowing. Two kinds of bacteria have been found in the pus, and a considerable number of experiments and cultural observations have been made with them. I do not propose to give these observations in detail, as no proof of pathogenic action has yet been obtained in connection with the cultures. Indeed, although there can be little doubt that the abscesses

[1] From his Annual Report for 1909 to the Board of Agriculture.

result from bacterial infection, and it seems not improbable owing to the distinctive characters of the pus and the regularity of the symptoms that they are caused by a specific virus, inoculations performed with the actual pus on sheep and other animals have given negative results. The only experiment which gave anything approaching a positive result was one in which a lamb, aged about 4 months, cohabited with and fed out of the same trough as three affected ewes. After seven days' cohabitation the lamb became distinctly ill, showed slight swelling of the lips, and a few small sores appeared on the skin of the muzzle. The illness lasted about ten days; temperature 104·8° to 105° F. The lesions healed in seventeen days, however, and although the lamb has been under observation for several months there are no signs of abscesses.

The disease had been diagnosed as "caseous suppuration of sheep." This, however, seems to be an error, for the bacillus of "caseous suppuration" can be easily identified, and it is not present in the pus in the disease under discussion. Moreover, the lesions are quite different from those of "caseous suppuration."

(2) Scrapy.

This is a disease of sheep which is only known in a limited area of Scotland, but it has been reported that the area is extending. On the latter point, however, the evidence available is not convincing, and it is difficult to get full information on account of the reticence observed by farmers.

Apparently the disease only affects ewes after they have had two or three crops of lambs. The symptoms are rather peculiar, and may at first be confounded with scab. One of the first signs is an itchy condition of the skin, which gradually becomes worse, and compels the animals to constantly rub themselves against fixed objects. The skin, however, shows no eruption, as in the case of scab, and no acari can be found. The affected animals become very much emaciated. Small abscesses, which are probably only the indirect result of the disease, may appear at various parts of the body, particularly about the head. Eventually the animals die from emaciation if they are not previously slaughtered, but affected animals may live on in a miserable condition for several months. Dipping has no curative effect; on the contrary, it seem to intensify the symptoms. If we accept the local statement that the disease is spreading, one is justified in thinking that this may be a disease which is transmissible either by direct or indirect infection. It has not been possible to obtain a great deal of

material, and from local inquiry by one of the Board's Veterinary Inspectors it would appear that shepherds and farmers are inclined to class more than one disease with totally different symptoms under the head of Scrapy, although some of the ailing animals do not show the most prominent symptom of scratching, from which the disease has apparently received its local name. In the case of one animal which had been affected for several months, a condition of the bowel somewhat resembling that present in Johne's disease was discovered at the *post-mortem* examination. Acid-fast bacilli, indistinguishable from those found in Johne's disease, were also present in large numbers under the microscope in a small area of the intestine. This important lesion, however, which seemed at first to throw an unexpected light upon the cause of the disease, has not again been discovered in a very restricted number of autopsies which it has been possible to make on other affected animals. A considerable number of experimental observations have been undertaken at the laboratory. These, however, have not yet matured, and it is thought advisable to submit to a prolonged period of observation the experimental animals which have been exposed in different ways to what for the moment may be called the hypothetical infection.

REFORM IN BLINKERS IN HAMBURG.—The horses of Hamburg have reason to congratulate themselves. Blinkers now are allowed there only if they stand well away from the horse's eyes. The number of towns in which blinkers are being done away with is steadily on the increase. Berlin was the first to start the reform by abolishing them altogether, through the influence of von Borries, chief of the police. Dusseldorf, Ostrowo, Aachen, Konigsberg, and Cassel followed. In Darmstadt they are allowed only when found necessary, and now in Hamburg only if wide open. In many cases these "blinkers" become veritable "squinters," as they allow the horse to look only straight in front instead of all round, as he naturally would. Formerly no one outside the Animal Protection Societies cared at all about the troubles of the horse, and they were powerless. Since, however, Berlin made a start, there are many cases to show that horses can be driven safely without blinkers. We now only want energetic workers to extend the movement.

Clinical Articles.

TWO CASES OF LAMINITIS TREATED WITH ADRENALIN.

By Captain A. J. WILLIAMS, F.R.C.V.S., A.V.C.
Mounted Infantry School, Longmoor, Hants.

Case 1.—*Subject:* A transport horse of the Mounted Infantry, aged 13 years.

History, &c.—Previous entry on the veterinary history sheet: Laminitis both fore feet; admitted for treatment January 6, 1910; discharged to duty on January 23, 1910. On September 1 last the horse was admitted for treatment very lame on both fore, with the usual symptoms of an acute case of laminitis. Temperature 102·4° F.; pulse 40 and very full.

Treatment.—The shoes were removed and the hair over the region of the digital arteries clipped and area painted with iodized chloroform. Adrenalin hydrochloride 1 in 1,000 solution 1 drachm, and normal saline solution 3 drachms, was prepared, and a fourth part injected into each side of both fore pasterns below the fetlocks, at 1.30 p.m. The animal was placed in a loose box and aloes 4 drachms given.

3 p.m.—No improvement. Temperature, 103° F.; pulse, 64. Tucked up appearance, and grunts when made to move. Poultices applied.

September 2, 1910.—A great improvement this morning; feet cool; pulse not so full, and the patient moving much better. 1.30 p.m.: Adrenalin injected as before. 3.30 p.m.: Very lame again; shows as much difficulty in moving as when first admitted. Grunts when made to move; physic acting well; clay poultices applied.

September 3, 1910.—Moving very well, trots fairly freely; exercise for one hour twice daily; hose applied to feet, and standing in clay in loose box.

September 4, 1910.—Moving freely; continue exercise.

September 5, 1910.—Shod with bar shoes and turned into a paddock.

September 12, 1910.—Continues to do well.

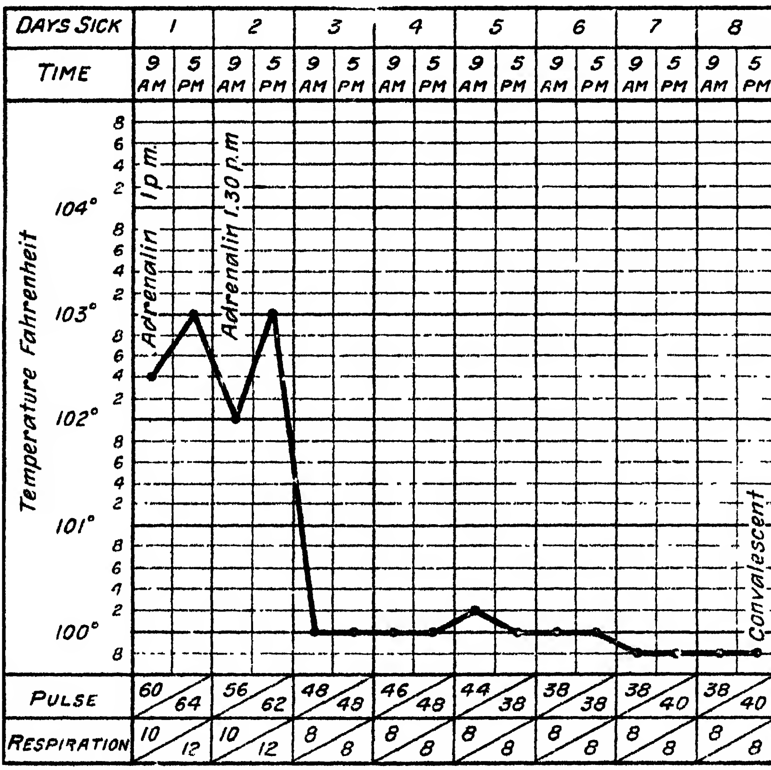
September 15, 1910.—Relapse this morning. Temperature, 102·2° F. Marked laminitic gait, but not as bad as when first admitted. Adrenalin injected at 1.10 p.m. 2.30 p.m.: Much worse; temperature, 104·2° F.; pulse, 100; respiration, 20; lying down in great pain; could only rise with great difficulty, and unable to move. Chloral hydrate,

½ oz.; warm poultices. 5 p.m.: Temperature, 104·8° F.; pulse, 108; respiration, 22.

September 16, 1910.—Horse up and moving fairly well; temperature, 102·2° F. Aloes 4 drachms given. One hour's exercise.

September 17, 1910.—Doing well; clay poultices; continue exercise.

September 19, 1910.—Patient moving well. Shod with bar shoes; two hours' exercise. Shuffling gait remains.



CASE I. Chart 1.

September 30, 1910.—Discharged and sent to light work. Noted for casting, unfit for further service.

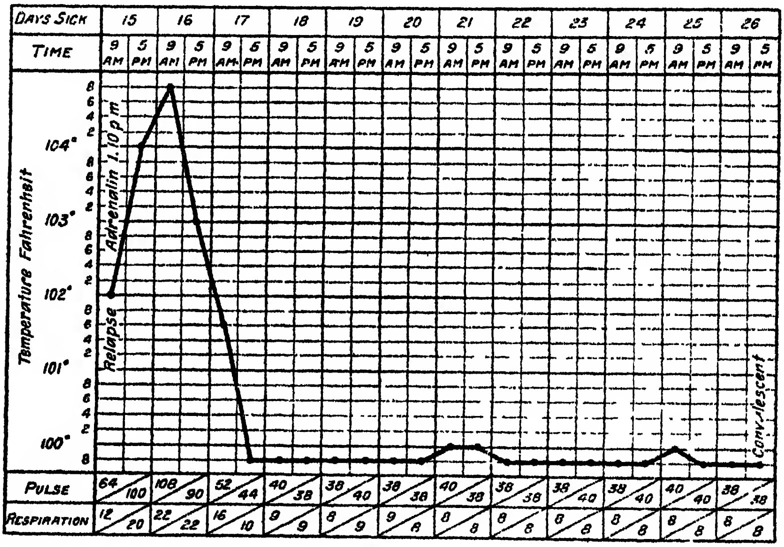
There was no further improvement, and the animal was cast and sold.

CASE 2.—Army Service Corps horse, attached to Mounted Infantry.

On September 25, 1910, the horse did a 23-miles march from manœuvres; it was a very hot day and a trying march; at the end of the march the horse was exhausted.

On the morning of September 26 the horse was brought to the sick lines with great difficulty, and dropped down soon afterwards. Feet very hot, pulsation in digital arteries marked, temperature 103·2° F., pulse 100, respirations 60. At 10.30 a.m. adrenalin injected, same as in Case 1. About twenty minutes after the injection the horse got up; at 11.15 he was able to shuffle along well; after ten minutes forced exercise he could be made to do a shuffling trot. Continued exercise for half an hour, poultices applied and aloes 4 drachms given.

September 27, 1910.—Much worse, could not move. At 5 p.m. still unable to move, in great pain; poultices applied.



CASE I. Chart 2.—The Relapse.

September 28, 1910.—Temperature 102·6° F., pulse 100, respirations 48. Injected adrenalin at 10.45 a.m. At 11.45 a.m., lying down, cannot get animal on his feet; 2.30 p.m., still down, brighter, eating a little mash; hose applied to feet and clay poultices.

September 30, 1910.—No improvement; adrenalin injected 4 p.m.; managed to get animal on his feet with great difficulty, but could not move him out of the box.

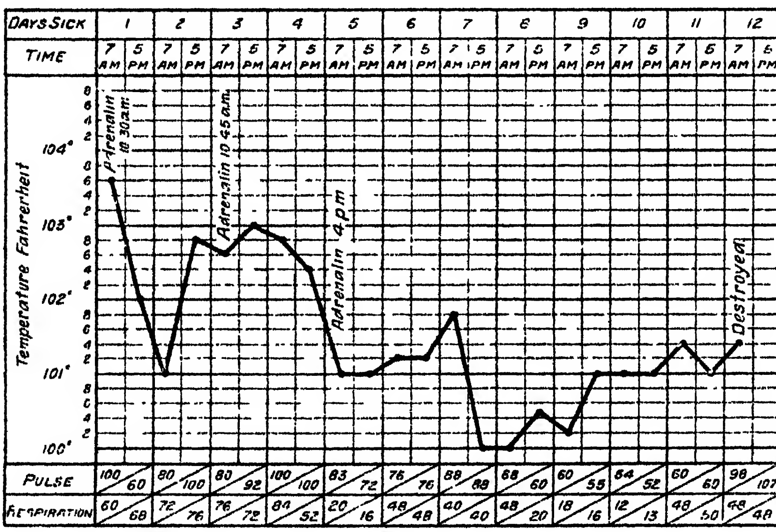
October 2, 1910.—Managed to get horse outside for a little exercise but with great difficulty.

October 5, 1910.—Getting worse, knocking himself about, and

spends most of the time lying down; general condition very bad, extremely tucked up. Temperature 101·4° F., pulse 107, respirations 48.

October 7, 1910.—Case considered incurable and animal destroyed.

Remarks.—Case 1 showed no improvement till the morning after adrenalin was injected; thinking another injection would probably be followed by further improvement, it was carried out, with the result that two hours afterwards the animal was in a far worse condition than before the injection, followed by marked improvement again the following morning.



Case II.

On September 15, 1910, there was a peculiar relapse; injection of adrenalin was followed by a marked rise of temperature, increase of pulse and respirations; condition much worse all round. Again there was marked improvement the morning following the injection; the attached temperature chart shows this well.

Case 2 was a very acute case, and one in which I thought adrenalin would probably give favourable results, but it failed to reduce the severity of the attack in any way. I saw the case soon after the animal dropped outside the sick lines; there seemed no hope of the animal getting on his feet by himself, or being able to support his weight if he was lifted up; it was astonishing to see him get up about

twenty minutes after the injection, and seeing that he could be made to do a shuffling trot within an hour from the time adrenalin was used, I had hoped it would turn out to be a successful result, but this wonderful improvement was not maintained, and further injections had no effect.

TWO INTERESTING CASES OF FOREIGN BODY IMBEDDED IN THE PALATE.

By GEORGE D. MARTIN, M.R.C.V.S.

Westcliff-on-Sea.

CASE 1.—On June 22, in the evening, a large adult fox terrier was brought to my surgery by his owner, who informed me that he feared his dog had injured his mouth in some way, or had something stuck in his throat. The symptom that had attracted his attention particularly was that the dog could only open his mouth about half way or less, and trying to yawn immediately caused the animal to howl piteously as if in great pain and to close his mouth again at once.

Examination externally was without result, and attempting to open the mouth met with violent resistance from the dog, and as soon as the mouth was opened about half he shrieked and struggled in desperate fashion. However, with perseverance and much patience, it was possible to locate a small wound in the left side of the hard palate level with the posterior border of the last molar tooth. Palpation, which, as may be imagined, owing to the situation, was extremely difficult, showed considerable swelling which rendered it impossible to say definitely what was the cause of the condition, but probing carefully showed some foreign body present, wood or bone.

By this time it was obvious that resort to chloroform was the necessary course, but bleeding was so copious that it was feared asphyxia might result. Presently I was successful in removing a small splinter of wood, quite black and about 1 in. long by $\frac{1}{8}$ in. thick. Further inquiry elicited the information that the dog had been seen playing with a piece of stick about a fortnight previously, since which time he had been dull and off feed, and the symptoms described above had gradually become more noticeable.

On a diet of liquids, with appropriate antiseptic powders, the patient made an uneventful recovery.

CASE 2.—The evening of August 27 brought me an exactly similar

case to the above in a well-grown vigorous Airedale dog, of some 11 months. This dog had been noticed playing with his "stable companion," a collie, in the afternoon, with a longish piece of stick, and the Airedale had been observed to suddenly give a gulp and go away and lie down by himself. His owner, trying to find out the cause of his depression, in the evening found that opening the mouth caused much distress, and sought my assistance.

A preliminary examination, made with great difficulty, owing to the struggles of the dog, a very strong animal with most powerful jaws, showed a small punctured wound on the left side of the hard palate in exactly similar situation to that in the case previously described. The dog exhibited such great distress and his struggles were so violent that chloroform was administered, and on further examination a foreign body of the size of one's little finger could be detected lying longitudinally in the tissues of the part. Enlargement of the wound to permit of introduction of forceps made it possible presently, after some considerable and difficult manipulation, to withdraw two pieces of wood, the halves of a round piece of dead wood 2½ in. long by ½ in. thick. Hæmorrhage was trifling, and after dressing the wound with antiseptics a sedative was given and the patient put to bed for the night.

The dog was very subdued and inclined to lie about for some three or four days, but under saline and sedative treatment with a diet of milk, soup, &c., recovery was uneventful and he was discharged quite normal again on the ninth day.

CASTOR OIL POISONING.

FRANK CHAMBERS, M.R.C.V.S.

Umtata, South Africa.

It is not often that the cure is worse than the disease, but such a case happened through the too energetic use of a parasiticide by a small farmer in a town on the Cape Natal border recently.

A smear from a cow which had died on the farm was sent in for examination. The *Piroplasma parvum* was in abundance and naturally East Coast fever was diagnosed. I got into communication with the Government Stock Inspector for that district and learned that many cattle were dead and several were sick from what was thought to be East Coast fever. Not being far away I journeyed to the farm to see what appeared to be an interesting outbreak of that terrible

scourge, for the farm was completely fenced in and very free from ticks.

On arriving at the farm I found that twelve cattle were dead and nine of the remaining fourteen were ill. To keep the cattle free of ticks the owner had been smearing his cattle weekly with a smear of his own concoction. It was composed of equal parts of castor oil and antifriction grease. Nothing happened for several weeks until the one cow died of East Coast fever, and in a few days many cattle became ill and twelve died in rapid succession.

The natives were busy skinning the dead cattle and cutting off the tit-bits for their own consumption, so there was little trouble in making several autopsies. The *post-mortem* appearances were in every case identical. The mucous membrane of the rumen was inflamed in patches and readily peeled off. The mucous membrane of the abomasum was intensely inflamed and in places was ulcerated. The lungs, liver, and kidneys were normal. In two cases the small intestines were inflamed. All the animals went down to the water to die and the natives opened them there, allowing the contents of the stomachs and intestines to pollute the stream regardless of who might be using the water below.

From the *post-mortem* appearances I came to the conclusion that these cattle had not died of East Coast fever, as the lesions of that disease, viz., infarcts on the kidneys, &c., were absent. Moreover, smears taken from the spleen and lymphatic glands on being examined failed to show Koch's bodies or any other parasites.

After the cattle had been smeared they naturally licked off as much as they could possibly reach, for any substance like grease on the skin is regarded by a bovine as most objectionable and he does his level best to get rid of it, usually by licking it off.

In this way it is plainly evident that a beast would if smeared once a week consume a large quantity of castor oil in time with ill effects.

The remainder of the cattle with the exception of five old bullocks were visibly ill. The legs were swollen tremendously; this being due to the irritant action of the prolonged use of castor oil, and there was a dropsical effusion in the region of the dewlap.

The cattle experienced great difficulty in walking owing to the pain caused by the flexion of the blistered joints. The thin parts of the skin, such as that under the tail and between the hind legs, was badly blistered. The temperature of the affected animals was

normal. The pulse was slightly accelerated. Diarrhœa accompanied by an intense thirst was a constant symptom.

Treatment consisted in advising the owner not to smear the cattle again, but to go in for dipping or spraying as soon as the cattle were fit. Tincture opii. and spt. ether. nit. in cold flour gruel was prescribed with evident success, as all the sick animals made a good recovery.

UMBILICAL HERNIA—OPERATION BY DEGIVE'S METHOD—DEATH.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

Subject.—A yearling filly.

History.—The hernia was not of large size, but the opening wa rather wide. Having had good success in a previous case with Degive's method, I decided to again adopt it.

The case progressed favourably until the tenth day, when the animal went off her food and started to purge severely. The temperature rose to 106° F. and the general appearance of the animal was unfavourable. The clamp had partially separated from the skin and was removed; a large surface denuded of skin remained. The purging continued for two days; the animal lay down for long intervals, no tympanites present, but the abdominal muscles were hard and the abdomen "tucked up." No distinct pain present, expression of countenance haggard, pulse quick and weak, respirations accelerated and thoracic in character.

Next day the animal was weaker, and lay down continuously; sweating was profuse, and abdominal muscles hard and contracted. As the case was hopeless, the animal was destroyed.

Autopsy.—On examining the hernial ring, it was found that the adhesions between the edges were very weak and the surrounding muscular tissue attenuated. On inserting the finger, it was found that intestinal contents were free in the abdominal cavity. Further examination showed a minute opening in the cæcum and the latter was attached by adhesions to the hernial ring. Lesions of septic peritonitis were present.

Remarks.—It seems hardly likely that the intestine could have been caught by the clamp at the time of operation, as symptoms would have appeared early.

The first symptoms shown—viz., severe purging—is not what

one would expect in the primary stages of peritonitis. Probably I enclosed too much tissue in the clamp at the time of operation, and this may be a point of importance when carrying out the procedure in future.

In the other case, in which I adopted Degive's method, the progress and result were most satisfactory.

The difficulty in the operation, to my mind, comes in with reference to the insertion of the needles, so as to get the necessary depth, without taking up too much tissue. If too little be taken the clamp is likely to slip below the edges of the ring and fail to bring about the desired adhesion. However, one learns by the commission of errors, although the experience is often very expensive.

"MAD" STAGGERS.

By E. WALLIS HOARE, F.R.C.V.S.

Subject.—A 5-year-old harness mare.

History.—The animal was in high condition and had been doing very little work lately.

On the evening of June 2, she was observed to be in pain, lay down and rolled a few times and moved with an unsteady gait.

The owner administered a drench composed of spt. æth. nit. ℥iii., ol. lini. Oiss.

The animal became very violent, rushing about the stall, falling in a helpless manner, struggling with fore and hind feet; she rushed against the side of the stall and inflicted a deep wound on the forehead, exposing the bone.

I attended her at 10 p.m., and found that previous to my arrival she had been given with great difficulty by my foreman a drench composed of chloral hydrate ℥i., ol. lini. Oiss. It was very difficult to approach her, as she would without any warning rush forward and fall. The pupils of the eyes were largely dilated, the pulse full and quick, slight tympanitis was present.

As it was impossible to administer a bolus, I prescribed aloes Barb. ℥vii. in the form of drench, and gave calomel ʒii., ol. croton ♏x. made into electuary and placed on the back of the tongue.

The symptoms gradually abated and the animal became quiet. Next morning all evidences of cerebral excitement had disappeared, and the physic acted moderately; free purging, however, started in the evening.

The wound, which was very jagged and extended to the forelock,

was dressed with tr. iodine B.P. and covered with cyanide gauze, wool and bandage. It healed without any suppuration.

Remarks.—The cerebral symptoms in this case must be regarded as reflex in character. Some may think that the amount of purgative agents administered was rather excessive, but in cases where brain symptoms are present I find that ordinary doses have no effect.

AN INTERESTING PIGEON CASE.

By GEO. H. WOOLDRIDGE, F.R.C.V.S., M.R.I.A.
Professor in the Royal Veterinary College, London.

THE photographs herewith reproduced illustrate a case which is quite unique in my experience.

The bird, which is an excellent racing pigeon, was brought to me on July 13 with what appeared to be the point of a pin or needle protruding from the middle of its back. The bird had been racing the previous week, but the owner had only noticed this condition during the previous day. On examining the offending body closely by

Pigeon shewing Pin protuding from the back.

pulling away a few of the short feathers round it, it was found to be protruding a little over a quarter of an inch. The point for an eighth of an inch was clean, and for the remainder of its visible portion it was coated with firm inspissated exudate. It was then grasped firmly with forceps and extracted, and proved to be a pin with the head partially removed by some means. The catarrhal coating of the pin, as may be seen by the second photograph, extended a little more than half an inch, and the rest of the pin was clean-looking but discoloured. On withdrawing the pin it was followed by a tiny speck of exudate, which was wiped away, and the puncture soaked in chinosol solution 1 in 500 and dusted with powdered boric acid. The bird made an uneventful recovery. The pin was re-inserted into its track for taking the first photograph.

This is another example of the resistance of birds to ill-effects from wounds. It is probable that the pin was making its way by a fistula

from the gizzard, which is very strong and muscular, and the pin was very sharp. It is improbable that any other viscus would be powerful enough to drive the pin through that position, close to the middle line of the back.

Pin after removal.

The photographs (which, of course, are not on the same scale) were kindly taken for me by Mr. A. L. Sheather.

MAJOR-GENERAL ROBERT PRINGLE, C.B., D.S.O., M.R.C.V.S.

THE position of Director-General of the Army Veterinary Corps is the highest reward the Service can confer upon those who select to follow this branch of the profession, and to attain such a position is the ambition of every veterinary officer. The selection of Colonel Pringle and his consequent promotion to the title of Major-General has given universal satisfaction, for if one point has been noticeably stronger than another in the career of the new Director-General it is that of tactful administration and organization.

Born at Stranraer in 1855 and educated in Scotland, he is one of the students to whom the Glasgow College can point with pride. He joined the Army Veterinary Department in 1878, just in time to see active service in the Afghan Campaign of 1879-80, for which he holds the war medal. He was in the Waziri Campaign of 1881, where he was mentioned in despatches, and the Zhob Valley Expedition of 1884.

Later, for services rendered during the South African War, he received the D.S.O. decoration, and was again mentioned in despatches, being promoted to Lieutenant-Colonel. At a more recent date still he was made a Commander of the Bath. Nearer home his responsible positions have included those of Principal Veterinary Officer for Ireland, and the same position in the Aldershot Command; whilst in India, on the retirement of the late Colonel Nunn, he was appointed Principal Veterinary Officer.

In the world of sport he is well known as a good rider to hounds, a good polo player, fond of racquets and other outdoor active pursuits. In the selection of Major-General Pringle by the authorities at the War Office the profession may rest assured that the veterinary military portion is in safe hands, and that the Army Veterinary Service will continue to progress as steadily forward during the next five years as it has done during the administrations of distinguished gentlemen who have preceded him.

Canine Clinical Notes.

VARICOCELE IN THE DOG.

By E. WALLIS HOARE, F.R.C.V.S.

Cork.

Subject.—A foxhound.

History.—The dog was sent in for surgical treatment, as in consequence of the great length of the scrotum and the position of the testicles he was constantly getting these organs injured while hunting. On examination, the spermatic cords were found to be of inordinate length, and on palpation very thick, and a marked pulsation could be felt; the testicles hung very low and were much smaller than normal structures.

Castration was advised.

Local anæsthesia was induced by means of injecting eucaine and adrenalin, one injection being made over the median line of each testicle, and one into each spermatic cord.

After about ten minutes local anæsthesia was perfect; one testicle was exposed, and the spermatic cord was found to have the spermatic veins enormously enlarged and in a varicose condition; the spermatic artery was also much larger than normal. A ligature of celluloid thread was applied to both artery and vein as high up as possible, and the testicle and portion of the cord were removed.

The other spermatic cord was in a similar condition and the same procedure was adopted.

Shortly afterwards there was continuous hæmorrhage from one side of the scrotum, and firm pluggings with cotton-wool failed to arrest it.

A further examination showed that the ligatures were perfect, but that the hæmorrhage came from a dilated artery in the lip of the scrotal wound. This vessel was ligatured, and the case made a good recovery, the scrotum shrinking up so that the animal was fit for hunting purposes.

Remarks.—One lesson to be derived from the above case is that hæmorrhage after castration does not always arise from the spermatic artery.

SOME NOTES ON THE TREATMENT OF DISTEMPER IN DOGS WITH NUCLEIN.

By JAMES PEDDIE, F.R.C.V.S.

Dundee.

It is well known there is no disease which taxes the powers of the veterinary clinician more than distemper, and we are ever ready to adopt any measure that is supposed to strengthen our hands with regard to its treatment.

Like the poor, distemper is always with us, and few veterinary surgeons (at least those in town practice) have long to wait for cases coming along in order to try any new remedy. During recent years a good many veterinary surgeons have tried nuclein in various animal affections, but I am not aware of any very definite pronouncement with regard to its value in the disease now under consideration. Distemper has been very prevalent in this part of the country for a considerable time, and in the beginning of this year I determined to give nuclein an extended trial with a view to ascertaining its merits in this disease and placing same on record. The following cases of distemper will give some idea of the success met with :—

Case 1.—Curly-coated retriever dog, 9 months old, had been ailing for at least a week before I was called. The animal when seen was in a very thin and unthrifty-looking condition, was discharging from the eyes and nose and had a very troublesome cough, with occasional vomition; pulse 130 per minute, temperature 104·6° F., the respiration hurried, and the appetite in abeyance.

Diagnosis.—Distemper associated with broncho-pneumonia. The animal was given a hypodermic injection of nuclein, and put on a mixture containing potass. citratis, mist. heroglycerine co. and a bitter. It was removed from an open kennel and put into a comfortable shed, as the weather was cold. The nuclein injection was repeated daily for three days, then it was put on a mixture containing nuclein solution in one drachm doses night and morning in addition to the mixture already prescribed. In a few days the improvement in the animal's condition was noticeable, and at the expiry of a week or ten days it was very marked indeed. The temperature and pulse had fallen, the cough was not nearly so troublesome, and the appetite was wonderfully good. The nuclein was continued until the tenth day, and the animal made a steady and uninterrupted recovery.

Case 2.—Yorkshire terrier, bitch puppy, aged 7 months; discharging from eyes and nose, slight throaty cough, pulse 110, tem-

perature 103.2° F. The animal had two or three fits before it was brought to me, and was in a very miserable-looking condition. Nuclein was given in 10-minim doses three times daily *per orem*, and a mixture containing the following drugs thrice daily: Pot. brom., ammon. brom., chloral hydras, spt. chlorof., and a bitter. The administration of nuclein was continued for a fortnight. The bitch had another fit on the second day after I had examined and prescribed for it, and but for that it made a somewhat slow, although complete, recovery. The same owner also consulted me about a spaniel bitch puppy which from the symptoms described I had no doubt was also suffering from distemper, as it had been running about with the other dog. The symptoms described were: discharge from eyes, husky cough, occasional sickness, slight diarrhœa, off feeding, and very dull and lifeless. I was given the weight of the dog, and prescribed nuclein in mixture form three times daily. The owner, writing me three weeks later with regard to the dogs, made this observation: "The spaniel is getting on very well also; she is running about as hardy as ever."

Case 3.—Flat-coated retriever dog, aged 4 years, weight 70 lb. The animal had been ailing for fully a week before I was consulted, and had lost flesh considerably; discharge from eyes and nose, from the latter very profuse; in the mornings the nasal openings were almost occluded, cough troublesome, the fauces were much infected, and there was considerable bronchitis, breath fœtid, and bowels irregular. This case was treated as No. 1, with injections of nuclein daily for three consecutive days, and on the third day the temperature had fallen from 104·6° F. to 102·4 F., and the general condition was much improved. A mixture containing nuclein in 2½-drm. doses was prescribed, and this was continued night and morning for four days, at the end of which time the improvement was very decided; the animal had regained much of its lost spirit, and was feeding fairly well. The nuclein was continued for a few days in doses of 1 drm. once daily, and the dog made a steady and uneventful recovery.

Case 4.—Pedigreed bull bitch, aged 8 months, weight 33 lb. This animal was brought to me for treatment after the remedies prescribed by the all-knowing chemist had failed to produce any improvement. The bitch was obviously very ill, thin, and pinched-looking, discharging from eyes and nose, tongue furred, breath very fœtid, vomiting and diarrhœa; temperature, 105° F.

The prognosis was most unfavourable. Nuclein in 1-drm. doses

was given three times daily, and powders containing 20 grn. of tannoform were given at intervals to check the diarrhœa. As the animal was very weak, brandy, along with Valentine's meat juice, was administered three times daily. The second day after admission partial paralysis of the hind quarters was observed; the animal could not walk without frequently falling over to one side, and there was also twitching of muscles. At this period a very distressing symptom was added—viz., fits of whining, which occurred at frequent intervals, but fortunately only lasted for a few days. The nuclein was administered until the fourteenth day after admission. At this date the bitch was greatly improved, and feeding moderately, but it could not walk without still falling over to one side. It was given pills containing quinine, iron, and strychnine, twice daily. The animal was kept in hospital for six weeks, and at the end of that time, although it was greatly improved in condition, it could not walk any distance without occasionally falling to one side, although much less frequently than before. I advised the owner to have her sent to a farm in the country, where I saw her about a month ago, and was agreeably surprised to see that she had completely regained control of the hind quarters, was in splendid condition, and quite vigorous.

Case 5.—Samoyede bitch, aged nine months, had been to a show and developed distemper, subsequently the earliest symptoms being the usual discharge from eyes and nose and diarrhœa. The owner treated the dog for ten days at least with the assistance of the local doctor, and it was only when frequently recurring fits were added to the symptoms described that I was called in to see her. The bitch presented a pitiable spectacle, the tail and hind quarters were matted with the dark and fœtid discharges from the bowel, and with the salivation and rolling about during the fits she looked as if she had been drawn through a manure pit. There was marked twitching of the facial muscles, and the bitch was very irritable, a condition which was increased by the least fuss or noise. The pulse was 140, and weak, temperature 104° F., respirations irregular and somewhat cyclic in character. The treatment given was nuclein three times daily, and a mixture containing potass. and ammon. brom., chloral, spirit of chloroform and syrup of orange, every six hours. As soon as the animal was sufficiently quietened with the bromide mixture it was given a good hot bath in order to clean it. The fits recurred at less frequent intervals, but the bitch became quite paralyzed in the hind quarters. The paraplegia continued, and the bitch gradually

sank into a marasmatic condition, and died during the course of the third week after the treatment had commenced.

Case 6.—Field spaniel dog, pedigreed 10 months old, had also been to a show and contracted distemper which manifested itself in the gastro-intestinal form with vomiting and diarrhœa. Nuclein was administered three times daily. The diarrhœa was very troublesome, and the discharges particularly offensive. For this condition powders containing salicylate of bismuth, with small doses of calomel (⅛ gr.) were given with good results. In the course of a few days there was a very marked improvement, and the puppy made a steady and complete recovery.

Case 7.—Irish terrier dog, aged 18 months, had been ailing for about a fortnight before I was consulted. The symptoms presented were free discharge from nose and eyes, with a corneal ulcer on the left eye, husky irritating cough, bowels rather relaxed. There was a well marked eruption on the abdomen and thighs in this case. The dog was very thin and tucked up in the belly. Nuclein was given three times daily, the eyes were douched with boiled water, and argyrol and atropin solution instilled. After a few days the diarrhœa became very severe with a good deal of straining and a considerable admixture of blood with the discharges. Bismuth salicylate in full doses combined with morphia was given at frequent intervals until this symptom was controlled. During the second week of treatment the improvement was very decided, the corneal ulcer eventually healed, but left a considerable pigmentation behind which slightly infringed on the cornea. With the exception of a slight recurrence of the diarrhœa, the dog continued to improve and made a good recovery.

Every veterinary surgeon with experience of dog practice is well aware of the protean nature of the symptoms manifested in distemper, and the cases I have selected for description serve partly to illustrate this point. I could go on describing many others of which I have a record, but as they follow more or less closely on the lines of those given, it seems superfluous to detail them and would only unnecessarily prolong this article.

I have in all treated thirty-two cases of distemper with the aid of nuclein solution (veterinary), and have only had four deaths, a percentage of recoveries which I could not have hoped for with the treatment previously adopted. Nuclein is said to produce an increase in the number of white blood cells, with a corresponding increase in the germicidal power of the blood. It seems reasonable to assume that

an agent having this action should be valuable in an infectious disease such as distemper, and certainly the cases I have treated with it so far have led me to form a high opinion of its value in this disease. I had no experience with regard to the dosage of nuclein, but Messrs. Parke Davis and Co., whose preparation I used, informed me that they had found 1 minim per pound of body weight when injected hypodermically, and 2 minims per pound of body weight when given *per os*, quite sufficient, and my dosage followed very nearly on those lines. In the cases where I administered nuclein hypodermically. I had no trouble at the seat of injection. The nuclein was diluted with an equal volume of normal salt solution when given hypodermically.

I consider the dieting in a case of distemper of the greatest importance. Where there is vomiting and diarrhœa the food should be absolutely cold. The food should always be of the lightest possible character, such as milk, to which may be added switched white of egg, boiled white fish, and well-boiled tripe, to both of which a little wheaten flour may be added; boiled rice with milk, lactol, boiled rabbit, cold beef jelly, raw lean beef, minced, &c., &c. I am a firm believer in Valentine's Meat Juice for tiding a patient over a crisis, although it is expensive. It is given in cold water, and brandy can be administered with it.

In conclusion, I would just like to add that the majority of the cases of distemper which I have treated with nuclein have not been by any means mild ones, and I have not got them very early, as I find there is a growing tendency for people to dabble with remedies advertised in the various dog papers before consulting a veterinary surgeon.

It may be argued that I have had a special run of luck; that may be so, but I am, nevertheless, firmly of opinion that nuclein is a most valuable agent added to the list of remedies which we have at our disposal in the treatment of distemper.

CANINE PIROPLASMOSIS IN MADRAS.

In his report on the micro-biological section of the King Institute of Preventive Medicine at Guindy, Dr. F. M. Gibson, the Acting Director, publishes a Progress Note by Captain W. S. Patton, I.M.S., the Assistant Director, on his protozoological investigations, in the course of which he refers as follows to the great loss sustained last December by the Madras Hunt in the death of a number of the hounds from what turned out to be canine piroplasmosis:—

Last December the hounds of the Madras Hunt became ill and the Honourable Mr. W. O. Horne, I.C.S., Hunt Master, applied to the Institute, in order to ascertain the nature of their disease. The examination of the blood of the sick animals has resulted in the discovery of a new pathogenic piroplasm of considerable interest. It was conjectured that the hounds probably acquired the parasite from the familiar jackal (*Canis aureus*) which is regularly hunted in the suburbs of Madras. I was fortunate in being able to shoot a jackal in broad daylight, and in its blood the identical piroplasm which was first found in the blood of the sick hounds was at once discovered. The blood of this jackal was inoculated into three bazaar dogs, two of which had had a recent attack of *Piroplasma canis*. The three dogs showed this new piroplasm in their blood after an incubation period of fifteen to sixteen days. A number of other dogs were inoculated with the blood of a hound, and four of these have also become infected, one of which died of the disease after twenty-three days.

The parasite is commonly seen in the blood of an infected dog as a small ring, either with a large single mass of chromatin or two masses, one of which is much smaller. It may be pyriform or oval in shape and some forms are seen to be amœboid. It is about half the size of *P. canis*, and its protoplasm is much less voluminous; the typical double pear-shaped bodies so characteristic of the common piroplasm of the dog are rarely seen. The disease is much more chronic, slow in onset, causes extreme anæmia, enlargement of the spleen and liver and great emaciation. In bazaar dogs fever is not a marked accompaniment, but in the hounds the temperature frequently rose to 106° F. Trypanblau has no effect on this parasite. For this new piroplasm of the jackal I propose the name *Piroplasma gibsoni*, in honour of Dr. Gibson, who first saw it. The complete description of it and the disease it produces will be published in due course. A few of the hounds were also found to be infected with a trypanosome, probably *Trypanosoma evansi*. This organism is also being studied in dogs, and its method of transmission will, it is hoped, be found in time. —*Madras Times.*

Abstracts and Reports.

GLASGOW VETERINARY COLLEGE.

Introductory Lecture.

By WM. FREEMAN BARRETT, F.R.C.V.S.

President of the Royal College of Veterinary Surgeons, London.

At the very outset of my speech I am anxious to make one little confession, and it is this, that when I received a letter from Mr. Russell containing the invitation of your Governors to deliver the introductory address to you, I was very much surprised, because the view at once crossed my mind that I did not profess to be either a medical or veterinary scientist, nor could I call myself a skilled veterinary practitioner, and for this reason, that thirty years ago I was attracted by the study of the law, and I am afraid I somewhat abandoned the profession in which I was earlier trained. But although for many years, as I have said, I have been engaged in the pursuit of another profession, I have never lost my love for the old one. Gentlemen, I am just as anxious to-day that the veterinary profession should succeed as I was when a student in the Camden Town Veterinary School. I have not prepared a scientific lecture; I have come for another object. I have come essentially to thank the Governors of this Institution for what they have done for you, and for what in the future they will do for the profession. I felt that if I were to sit down and write a dry paper I would thoroughly fail in conveying to them the due appreciation of the sentiments which I entertain of what they have done for you, and I desire to thank you and the Governors for the honour done me in asking me to come here.

But, gentlemen, other reasons prompted me to come here, and one particular reason was this, that a day or two after I received the letter from Mr. Russell I received another letter from my esteemed and respected friend, your Principal, and it was one of his typical letters—one of his kind, courteous letters—and he seemed very anxious that I should address you, and I felt I owed it to him and to your Governors that I should come to Glasgow this day. Certain particulars have been supplied to me with regard to the Glasgow College, and after what I have been told and seen, I must confess that I am surprised at the size of your buildings and of the class-rooms.

Gentlemen, having regard to the premises available to you for the purpose of teaching medical science, you have here almost commodious buildings. What you are lacking in at the present time is the number of your students. When the parents and guardians of Scotland ascertain with more precision what is the outlook of the profession, instead of the number of students at the College being 50, you will have not less than 150.

Now, gentlemen, I find that this College was founded and affiliated in the year 1863, and from then until last year no Government aid was given to it. There have been many difficulties in the conduct of

the work here. During these years science has gone ahead by leaps and bounds, and I can imagine the struggle which our old friend the Principal must have had in carrying on the work of this institution. There is no man in this room who does not appreciate the important work which he has done, but I believe this institution has now been taken over by the Government, which will enable the work to go on with more smoothness. I find that since this college was established no less than 3,000 students have graduated from it, and the great majority of them have done well in their profession, and have been a credit to the institution in which they were educated. I find that the entire buildings have been purchased from the founder by the Governors, with money subscribed by the landowners, live-stock proprietors, and others, including the citizens of Glasgow, and I think the landowners and subscribers generally ought to be thankful for what has been done.

Your Principal has been good enough to hand to me one of your prospectuses. First of all on the list of Governors is the name of Lord Pentland. I understand this nobleman has taken a very great interest in this institution, and that it is largely due to his initiative and influence with his colleagues and to his kindness that you have received Government aid. I think it is my duty, as representing the head of the profession, to thank him for all he has done. I think I should also mention the name of Sir John Struthers, Secretary to the Scotch Education Department, who has been greatly interested in this work. I have likewise before me a list of Governors in which are contained many eminent names. I think I will, in justice to all, run over some of the representatives who are here to-day.

Sir Hugh Shaw Stewart, who is unable to be present, has always been a great friend of the profession, and there is our Chairman, Mr. J. Campbell Murray, who is a very good Chairman indeed. As he takes a great interest in the work, we are very much obliged to him for coming here to-day, and showing his interest in the Glasgow College. Then you have the representatives of the County Councils of Lanarkshire, Ayrshire, Argyllshire, Kirkcudbrightshire, and Buteshire, representatives from the University, the Glasgow and West of Scotland Technical College, the University Court, the Senate, the Town Council, the Highland and Agricultural Society, the Glasgow Agricultural Society, the Glasgow School Board, the Dumbarton County Committee, the West of Scotland Agricultural College, and lastly, I think I ought to refer to the citizens of Glasgow.

Now, gentlemen, passing on, sometimes I wish I had been born in Scotland. And I think it would have been an advantage too had I been born in Glasgow. What strikes me of being of so much importance is this, that you enjoy educational facilities in Scotland which we in England do not. I would especially allude to one scheme initiated at the instance of your Governors and by Principal McCall. I understand from what Principal McCall told me—I was very much surprised as well as very pleased—that the parents of any boy in Scotland may appeal to the Secondary Education Committee of the County Council with regard to the education of their boy. I understand that certain inquiries are made in regard to the position of the parents, in regard to the educational fitness of the boy, and in regard to his character. If these be approved there is a recommendation

made by the Secondary Education Committee to the County Council that a bursary of £20 a year be accorded to the boy. I understand that some boys have availed themselves of this and have entered this college. When such a system prevails, especially if that system be extended, the doors of the college will be open to almost the poorest lad in the land. We in England, unless our fathers are able to help us to a great extent, and unless a lad possesses brain power of an exceptional kind, have no hope of ever becoming a member of this learned profession. I hope, therefore, the parents will avail themselves more largely than they have done in the past of the advantages which accrue to them through their sons becoming members of this institution.

It is often said that the time for the veterinary surgeon is past. It is said that the invention of motor cars will render the services of the veterinary surgeon unnecessary. That in my mind is absolute nonsense. I do not myself remember the time when railways were built in this country, but I am told that the men of that time thought there would be no further use for horses. Farmers accordingly were induced to give up the breeding of horses, and the result was that that class of stock was never so dear as they then were. Although motor cars may become more numerous, the trade of the country is increasing by leaps and bounds, and the time has not yet come when even the carriage horse can be done without.

I now desire very briefly to allude to the choice and prospects of the profession. There are some pessimists, and curiously enough they are those who have been most successful in the profession. There is a desire that the veterinary profession should not be overcrowded. but I would say this, that the veterinary profession is not nearly so overcrowded as the profession of the Bar. I would like to point out that there are many other channels which in the course of a few years will be open to the veterinary profession. The Municipal and State authorities are alike beginning to realise the importance of veterinary science in relation to the questions of public health, and particularly as touching the meat and milk supplies of the community. The authorities are very much alive to the fact that the veterinary surgeon can help them with regard to these supplies, and I think those around me who are interested in agriculture will agree with me that the milk supply at the present time is anything but satisfactory. I happen to be associated with the London County Council, and during last year we have had between four and five thousand samples of milk taken, and you will be surprised to hear that of that number no less than 10 per cent. contained tubercle bacilli. Of the cows which we have had inspected by the veterinary surgeon, very nearly 3 per cent. are affected with tuberculosis of the udder. Acute tuberculosis in children is occasioned by the consumption of milk from such cows, and if that be so, the authorities will in a very short time seek the aid of the veterinary surgeon, so that the milk supply may be made more pure. Some use, no doubt, is being made of tuberculin, but I cannot help thinking that the municipal authorities and the agriculturists of the country have as yet failed to understand the very valuable services which the veterinary surgeons are capable of rendering. I regret very much that the Milk and Dairies Bill, introduced by Mr. Burns, was allowed to drop, because I believe he was promoting it on wise

and correct lines. There can be no doubt at all that serious efforts will be made in this direction, and that the services of the veterinary surgeon will be in more request than in the past.

Then there is the question of Government positions. The State may require the services of the veterinary surgeon, and I am quite sure those who desire to become qualified will find they have no difficulty in securing very good positions. There is not one unemployed man who has left this college, and some of the positions obtained are, what I would call for young men, somewhat lucrative.

In the case of the Colonies there is an increasing demand for the services of veterinary surgeons in the stamping out of contagious diseases and other work. During the past session three graduates of this college received Colonial appointments, one at a commencing salary of £450 a year, together with free passage and all travelling expenses for a period of three years. If that young man conducts himself properly—as I am sure he will, coming from this college—within four or five years he will be in receipt of £1,000 a year. The others have gone out at a salary of £500 along with free passage and all travelling expenses. I have known of barristers who have practised for twenty years without earning £500 a year. Then there is the ever widening field of canine practice. That is one of the most pleasant kinds of practice in the profession. You have made your election, and I think I may safely and honestly congratulate you on your choice. As a veterinary surgeon you cannot expect to amass a fortune, but you can easily earn a decent competence. It is something to do that and to spend your lives in the relief of pain and suffering in the dumb creation.

Now, gentlemen, I desire to offer a few words of encouragement and advice to those who are being trained for the A examination. To my mind this is the most trying examination of them all; it was certainly so, so far as I was concerned. I have been told by a student that this examination is in the nature of an obstacle race. I confess that getting over these hurdles is no mean feat. Most young men who come to college have been engaged in country work or play. They may have been playing cricket or football, with the result that the muscular system has been developed at the expense of the brain power. Consequently when they come to college and problems are put before them, they are often unable to grip the principles. But I might tell you this, that, if you work on steadily, honestly, and fairly, all these difficulties will vanish in a very short time. You will begin to dip into some of the mysteries of Nature's laws. After some months of study you will begin to lift one tiny shred of Nature's curtain. What is there behind that curtain? There are innumerable mysteries behind it. As you go on and your mind becomes expanded you will discover how little you know, and how very much there is to be learned. You will learn by-and-bye of the mysteries which surround you. Among other things you will be able for the first time to understand what combustion consists of, and what forces are set in motion when a lump of coal is thrown upon the fire. To you it will seem wonderful that the heat which has been stored up in it for centuries has by the agency of man been again presented to us for our necessities and our enjoyment. The man who does not learn that fact with interest and appreciation has no real reason to pursue

the cause of scientific study. Chemistry is one of the most interesting sciences. You will learn something of the composition of the earth which appears so diversified, and yet you will find that possibly very few elements enter into its composition. Take also the spectroscope. You will be taught something with regard to that wonderful instrument, which tells not only of what elements the earth consists, but what the elements in the heavenly bodies are. I think you will be surprised and interested when you are told by your learned teachers that the composition of the elements which constitute the earth is similar to those which are contained in the heavenly bodies. You will be told that there may have been a time when these bodies were connected with one another. That will give you some idea of the many mysteries which surround you. They cannot fail to interest your minds. They cannot fail to invigorate you in the pursuit of your studies, because I think the more you learn the less you feel you know, and this is how the mind of the scientific man becomes expanded.

Then with regard to the study of botany. I must confess that when I went to college I did not enjoy botany. I thought—unwisely, I afterwards discovered—that it was somewhat of a useless science. There was a great amount of detail in relation to it, but, gentlemen, I very soon discovered how fallacious that argument was. You cannot learn too much of botany, because it is a very wonderful science. Take, if you will, the known garden plants you see every day. The common buttercup will become something more than a mere plant with a yellow flower. Its delicate cellular structure will have been revealed to you; you will have discovered that it has even to breathe in order to live, and that it takes in carbonic acid gas and gives out oxygen, and thus Nature restores the balance. Further, it has reproductive organs just as skilfully and delicately arranged as ours. Thus botany forms an intensely interesting study.

Gentlemen, let me mention one other subject, which to me was almost unknown—bacteriology. We had microscopes, and we used them for ascertaining the cellular structure of the body, but I had hardly heard of any bacillus. It was about this time that Pasteur announced the important discovery of the *Bacillus anthracis* as the causative agent of the deadly disease anthrax. The vast importance of his discovery was not then realized, but I well remember a discussion which took place among the students, one or two of whom expressed the view that, if anthrax were due to a bacillus, it was not unlikely that other contagious diseases, such as consumption, diphtheria, small-pox, foot-and-mouth disease, and so on, were due to other bacilli.

Since my time at college the correctness of that supposition has been established, and now we know that many of the infectious fevers are occasioned by a living organism of the most minute dimensions, and of the utmost tenacity of life. It procures admission into, and propagates itself with wonderful rapidity within the body, and directly or indirectly in many cases it even arrests the functions upon which life itself depends. What a field for investigation there is open to you! Now, you students, let me beg of you, if I may, in the most earnest manner, to use your microscopes daily, and perhaps one of you, who knows, may discover the causative agent of cancer and render himself famous.

With regard to the practical part of your business I feel I am on safer ground. In any discussion of scientific matters I have to be very careful. I might easily make a slip or two. It is almost twenty years since I examined a horse for soundness, but much that you learn when young does not depart from you when you are old. It is very curious how the youthful mind, being trained in one particular direction, remembers the impress which was then created upon it. It is the last stage of your college career and a very important stage it is, because the student who fails to thoroughly grasp the theory of medicine and surgery cannot expect to succeed in after-life. Unless he is able to appreciate the diagnostic symptoms which are likely to present themselves in any given case, he is bound in practice to make very many mistakes. I found myself, as a young man, that I had great difficulty in diagnosing those diseases in which the symptoms presented were of an obscure character. You should especially remember the diagnostic symptoms of each disease, and when afterwards a series of symptoms are presented to you which on the whole tend to confuse the diagnosis, learn to eliminate by careful reasoning the diseased conditions which are unlikely to be present until you have arrived at the probable cause of the trouble. I can give you one illustration. I was once sent to examine a horse which was unwell. I made an examination of the animal, and discovered that it was suffering from broken wind. I prescribed for it and gave certain directions in regard to the diet and method of treatment. I told the owner his horse would never recover. I could give it some relief, but he was never to expect it to be sound. I went away for a holiday, and for that period I engaged a *locum tenens*. The latter examined the same horse, told the owner it was suffering from bronchial catarrh and would soon recover. He unwisely advised different treatment and gave it medicine for a fortnight, but as the animal failed to recover the client lost all confidence in the young surgeon and would never have him again. You must learn to appreciate the symptoms which are presented to you, and refer them to some particular diseased condition; if your knowledge is meagre, your diagnosis will mostly be erroneous, and your client will be displeased with you. It is essential, therefore, that you study efficiently the theory and practice of veterinary medicine and surgery, and you have ample facilities for such study here. You have as your principal my old friend, Mr. McCall. I think I may say, that perhaps for more than fifty years he has been engaged in teaching veterinary medicine and surgery in this college. I think I may also say that there is no teacher in this country who is skilled and so anxious to impart his knowledge to students as is Principal McCall.

Might I, gentlemen, in the kindliest manner possible, ask you to take advantage of his unique learning and experience? Absorb knowledge from him as often as you can, take it so long as you remain here, that when you leave this college you may say, "I understand the profession so far as a young man can." It is essential indeed that you should when qualified, exercise wisdom and care in the advice you give. How often a young man fails in practice because he has not sufficiently thought out the answer which should be given to inquisitive clients. You cannot be too careful in this respect. Always seek first to help your client. That is the principal aim in

professional life; he will early discover that you are studying his interests and will come to you with confidence for your advice, and that is what you want. No man can live by new clients. Let me also suggest this. I have seen many young veterinary surgeons who were rough in their manipulation of their patients. That does not impress your client. I particularly refer to canine patients. They are usually delicate little creatures. If you are rough with them the client will be inclined to consult some one else next time. Sometimes clients are rude to the veterinary surgeon. They have been rude to me; they have mistaken my object; they have failed to grasp the benefits that I was conferring upon them. Let me give you this advice; if they should be rude and unkind to you, resent them in silence, always remembering the maxim that "He who makes an enemy will one day or other lose a friend."

Gentlemen, I do not think I have much more to say. It is essential that you should pursue your studies with great zeal. The Governors of this College, if I may say it, have been good to this school, to the profession, and therefore you have a duty to them. They have given you extended facilities to learn your profession; induce them to feel by your energy that you are grateful to them. Then when you leave this College remember that you have become a member of a profession which is advancing by leaps and bounds, a profession which has not yet attained to that position in the State to which it is legitimately entitled. You will have become a member of a profession which even yet, I regret to say, is not adequately recognized by some medical men. Sometimes just a few medical men are yet inclined to look down upon the veterinary surgeon. Your preliminary education is on equality with his, your scientific education is equal to his, and therefore if you leave this institution less scientific, less learned than the medical students, you have not done your duty to your parents, to your College or to yourselves. Each one of you will either elevate or lower the veterinary profession. Remember this when you leave: You should never do one thing that your Principal would not have you do. If you adhere to this maxim there is before you a career of prosperity and pleasure. May I just finish by repeating to you the words of Smiles:—

> "Pitch thy behaviour low, thy projects high,
> Thus shalt thou humble and magnanimous be;
> Sink not in spirit, he who aimeth at the sky
> Shoots higher much than he that means a tree."

I hope success will attend your efforts, and that this College will grow and prosper in its noble work.

HEREDITARY UNSOUNDNESS IN HORSES.

*Notes on Evidence as to the Hereditary Character of Certain Pathological Conditions constituting Unsoundness in Horses (Principally Ossification of the Lateral Cartilages—Sidebone) Furnished by Examination of 2,636 Cases.**

By S. S. CAMERON, M.R.C.V.S., D.V.Sc.(Melb.).

Present Lack of Recorded Evidence.

Ossification of the lateral cartilages of the foot of the horse, commonly known as "sidebone," has been somewhat indefinitely classified as an "hereditary unsoundness" by various writers during the last half century. On the other hand, perhaps the majority of breeders and a number of authors have strenuously denied the influence of heredity as a causal factor, alleging that the ossification developed as a result of external injury or the unequal incidence of concussion brought about by the use of calkin shoes. Arguments, and experience of isolated instances, have been relied on by both sides, and no definite proof has been given whereby the doubts of the contenders might be set at rest. It does not seem to have been realized that the controversy was one capable of settlement by observation and record of the occurrence or otherwise of sidebone in the progeny of side-boned or sound parents throughout a series of generations in different families of horses; or perhaps, if it was so realized, the opportunity for making such observations and records has not been presented in most countries. At all events, no such observations have been recorded.

As late as twenty years ago, when the British Royal Shire Horse Society was contemplating the introduction of compulsory veterinary examination at its annual show, the question of the unsoundness to be classified as "hereditary," was remitted to a Committee of the Council of the Royal College of Veterinary Surgeons. No definite records being available, the Committee included sidebone amongst the unsoundnesses "considered" to be hereditary. Since then the same lack of definite records is apparent, and I have not been able to unearth any statistics relating to the subject. Even modern authors have been content to repeat the "general idea" as to the hereditary character of sidebone without furnishing evidence of records of examination. As instancing the unsatisfactory character of the evidence available on the point, the following quotations from present-day standard authors may be adduced:—

Williams ("Principles and Practice of Veterinary Surgery," 4th edition, p. 330): "It is generally admitted that the predispotion to sidebone is hereditary, and many breeders of the best class of cart-horses, being aware of the fact, are careful not to breed from an animal with them."

Hayes ("Veterinary Notes," 7th edition, 1906, p. 280): "Hereditary predisposition is well marked in this disease."

* One of four contributions to a Thesis presented to the University of Melbourne for the degree of Doctor of Veterinary Science, November, 1909. Published in the *Journal of the Department of Agriculture of Victoria*, Australia, which is the journal referred to in several parts of the thesis.

Reeks ("Diseases of the Foot of the Horse," 1906, pp. 365, 369, 370): "Sidebone constitutes one of the recognized hereditary diseases. Is sidebone hereditary? We can best answer that by saying that some several years ago the Council of the Royal College of Veterinary Surgeons, at the request of the Royal Commission on horsebreeding, drew up a list of those diseases 'which by heredity rendered stallions unfit as breeding sires,' and that in that last list was sidebone. Sidebones, therefore, are hereditary."

Axe ("The Horse in Health and Disease." 1st edition, vol. vi, page 387): "Sidebone is one of the most pronounced of hereditary diseases. Its tendency to arise in the progeny of affected animals is now known to every horsebreeder of experience."

Mollar and Dollar ("The Practice of Veterinary Surgery," page 630): "The causes are (1) congenital predisposition, in heavy coarse-bred horses."

Other pathological conditions constituting unsoundness which are generally regarded as hereditary are:—

Ringbone (exostosis at the distal extremity of the *os suffraginis* and on the *os corona*);

Bone Spavin (anchylosis with exostosis of the small bones of the tarsus—*the cunieform parvum, medium and magnum;*

Curb (sprain of the *calcaneo-cuboid* ligament);

Roaring (paralysis with atrophy of all the intrinsic muscles of larynx on the left side except the *crico-thyroideus*).

The following are also, but less commonly, classed as hereditary unsoundness:—

Bog Spavin (bursitis with permanent distension of the synovial capsule of the tibio-astragalus articulation or true hock joint);

Thoroughpin (bursitis with permanent distension of the sheath of the *flexor pedis perforans* tendon of the hind limb);

Navicular Disease (caries of the bursal surface of the *os naviculare;*

Nasal Disease (osteo-porosis), and

Chorea ("Shivering" or "Nervy").

The remarks made with regard to the absence of definite observations concerning heredity character of sidebone may be even more forcibly applied to all but one (roaring) of the above-mentioned unsoundness. Concerning the others, no exact evidence has ever been recorded to my knowledge. The following references from standard authors, relating to the more important of these unsoundnesses, indicate the usual attitude adopted when discussing their hereditary character. The tendency is for each author to launch an *ipse dixit*, rather than to furnish proof or refer to evidence:—

Ringbone.

Williams ("Principles and Practice of Veterinary Surgery"): "Hereditary predisposition is sufficiently proved and acknowledged. I therefore simply advise breeders of horses never to breed from a sire or dam having ringbones."

Goubaux and Barrier ("The Exterior of the Horse-French"): "The influence of hereditary has been recognized for a long time. Certain families of horses invariably transmit them to their descendants."

Axe ("The Horse in Health and Disease," vol. v., page 205): "Horses with upright pasterns, and animals with pasterns of undue length are specially predisposed to it."

Mollar and Dollar ("The Practice of Veterinary Surgery," page 607): "The existence of the disease in two or more feet suggests hereditary predisposition, and may often be traced to small, badly shaped joints or defects in the formation of the limbs. . . . Such conformation, being perpetuated in the progeny, renders it easy to understand why the disease is often inherited."

Bone Spavin.

Hayes ("Veterinary Notes," 7th edition, 1906, page 254): "Hereditary predisposition plays a large part in its production. . . . Bad conformation of the hocks has undoubtedly a predisposing influence."

Mollar and Dollar ("The Practice of Veterinary Surgery," page 721): "The intimate structure of the bones and ligaments may predispose to disease, as shown by the inheritance of spavin, and its occurrence in entire strains whose hock joints appear perfectly formed."

Curb.

Axe ("The Horse in Health and Disease," vol. v., page 300): "The causes . . . must be considered under two heads—viz., predisposing and exciting; of the former, heredity is a marked factor quite apart from conformation, for it is noticeable that the produce of some horses and mares . . . show a special liability to the disease."

Hayes ("Veterinary Notes," 7th edition, 1906, page 56): "Animals which have suffered from curb ought not, as a rule, to be used for stud purposes, for the conformation that renders a horse liable to this injury is often transmitted to the offspring."

Examinations Made.

The systematic examination of stallions organized by me as Chief Veterinary Officer, and carried out under my direction during the past three seasons in Victoria, has afforded an opportunity of ascertaining the proportionate incidence of most of these unsoundnesses in the different breeds or classes of horses, and the age-period at which they occur, and also of determining in some degree the extent to which certain of them run in families.

The observations which have been made—together with the records of relationship of sound and unsound horses—will, I think, furnish a material contribution to the evidence establishing the hereditary character of sidebone at all events. It is unfortunate that the records in most cases have reference to only the paternal side of the breeding of the individual horses examined; for there is no reason to believe that the hereditary influence of the dam is other than equally as potent as that of the sire. Indeed, the conclusion is almost irresistibly forced that, in the case of some of the families dealt with, the number of unsound descendants recorded would have been much greater but for the preponderating influence of "sound" blood on the dam's side.

Up to the present, under the Victorian scheme for the Government examination of stallions for unsoundness,* a total of 2,636 have been examined; 779 light horses, 558 ponies, and 1,299 draught horses.

TABLE I.—ANALYSIS OF UNSOUNDNESSES OF STALLIONS REFUSED CERTIFICATES, 1907.

Unsoundnesses.	Draughts		Lights		Ponies		Totals	
	Number Examined, 403		Number Examined, 301		Number Examined, 214		Number Examined, 918	
	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected
Sidebone ...	82	20·35	3	·99	—	—	85	9·25
Ringbone ...	9	2·23	4	1·32	2	·93	15	1·63
Spavin (bone) ...	3	·74	15	4·95	1	·46	19	2·06
Curb	—	—	6	1·99	6	2·80	12	1·30
Bog Spavin and Thoroughpin	2	·49	4	1·32	—	—	6	·65
Cataract (eye) ...	—	—	—	—	1	·46	1	·10
Totals ...	96	23·82	32	10·63	10	4·67	138	15·04

TABLE II.—ANALYSIS OF UNSOUNDNESSES OF STALLIONS REFUSED CERTIFICATES, 1908.

Unsoundnesses.	Draughts		Lights		Ponies		Totals	
	Number Examined, 501		Number Examined, 295		Number Examined, 199		Number Examined, 995	
	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected
Sidebone ...	99	19·76	1	·33	—	—	100	10·05
Ringbone ...	20	3·99	7	2·37	3	1·50	30	3·01
Spavin (bone) ...	3	·59	8	2·71	—	—	11	1·10
Curb	—	—	8	2·71	2	1·00	10	1·01
Bog Spavin and Thoroughpin	15	2·99	3	1·01	—	—	18	1·80
Roarer	—	—	2	·67	—	—	2	·20
Totals ...	137	27·33	29	9·83	5	2·50	171	17·17

* What this system is, how it was introduced, and the work that has been carried out under it, may be gathered from a perusal of the three first (1907, 1908, and 1909) Departmental Reports concerning it, which are published in the December, 1907, July, 1909, and April, 1910, issues of this Journal.

Certificates of freedom from hereditary unsoundness have been issued in respect of 1,954 horses (74·5 per cent.), and 417 (15·75 per cent.) have been refused certification as being found affected with one

TABLE III.—ANALYSIS OF UNSOUNDNESS OF HORSES REFUSED CERTIFICATES TO 5/10/09 (FIGURES EXCLUSIVE OF 32 N.Z. EXAMS.).

Unsoundnesses.	Draughts		Lights		Ponies		Totals	
	Number Examined, 395		Number Examined, 183		Number Examined, 145		Number Examined, 723	
	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected
Sidebone ...	81	20·50	—	—	—	—	81	11·20
Ringbone ...	11	2·80	3	1·64	1	·69	15	2·07
Spavin (bone) ...	1	·25	2	1·09	1	·69	4	·56
Curb	—	—	5	2·73	2	1·38	7	·97
Bog Spavin and Thoroughpin	—	...	1	·55	—	—	1	·14
Totals ...	93	23 55	11	6·01	4	2·76	108	14·94

TABLE IV.—AGGREGATE ANALYSIS OF UNSOUNDNESSES IN STALLIONS REFUSED CERTIFICATES DURING THE SEASONS 1907-8-9.

Unsoundnesses.	Draughts		Lights		Ponies		Totals	
	Number Examined, 1,299		Number Examined, 779		Number Examined, 558		Number Examined, 2,636	
	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected	Number Rejected	Percentage Rejected
Sidebone ...	262*	20·17	4	·51	—	—	266	10·09
Ringbone ...	40	3·08	14	1·79	6	1·08	60	2·28
Spavin (bone) ...	7	·54	25	3.21	2	·36	34	1·29
Curb	—	—	19	2·44	10	1·79	29	1·10
Bog Spavin and Thoroughpin	17	1·31	8	1·03	—	—	25	·94
Cataract (eye) ...	—	—	—	—	1	·18	1	·04
Roarer	—	—	2	·26	—	—	2	·08
Totals ...	326	25·10	72	9·24	19	3·41	417	15·82

* Thirteen horses rejected for other causes also had Sidebone, making a total of 275 draught horses with Sidebone.

or other of the listed unsoundnesses. The examination has not been confined to high-class horses. Practically all horses standing for public service in the State have been examined, and as showing the

range as regards quality it should be mentioned that 265 (10 per cent.) of the total number examined have been refused the Government certificate on the ground that they were below a reasonable standard for Government approval as regards breed, type, and conformation.

There has been examined, therefore, it may be claimed a sufficiency both as regards numbers and type from which to generalize concerning the incidence of the various unsoundnesses in different breeds or types, the age-period of their development, and, in a lesser degree, their occurrence in certain families of horses and non-occurrence in others.

INCIDENCE OF UNSOUNDNESS AS REGARDS BREED.

An analysis of the unsoundnesses met with in the different breeds of horses will be found in the accompaying tables. The first three tables relate to examinations made in the separate years, 1907, 1908 and 1909; the fourth table gives the aggregate figures regarding horses examined to date :—

Among the conclusions to be drawn from the results set out in the above tables, the following are of first importance :—

A.—Concerning Breeds of Horses—

(1) That hereditary unsoundness exists in draught horses to a much greater extent that in other breeds—to two and a half times greater extent that in light horses, and eight times greater than in ponies;

(2) That light horses are much less subject to hereditary unsoundness than draught horses, but much more so than ponies;

(3) That ponies are, of all breeds, least subject to unsoundness of an hereditary character.

B.—Concerning Hereditary Unsoundnesses.

(1) As regards *Sidebone* that—(*a*) Ponies do not develop sidebone as a form of hereditary unsoundness; (*b*) in light horses sidebone is so rare that it may be considered negligible; (*c*) this form of unsoundness is practically confined to draught horses, and is the most common of all forms of hereditary unsoundness in draught horses, and further that its incidence in draught horses is practically six and and a half times greater than that of any other hereditary unsoundness, either in draught horses or in any other breed.

(2) As regards *Ringbone* that—(*a*) In ponies and light horses the occurrence of ringbone is rare; (*b*) in draught horses ringbone is, next to sidebone, the most common form of hereditary unsoundness.

(3) As regards *Bone Spavin*—that this form of unsoundness—(*a*) Is practically confined to light horses; (*b*) is the most common form of hereditary unsoundness in light horses; (*c*) is so rare in ponies and in draught horses as to be regarded as practically negligible.

(4) As regards *Curb* that—(*a*) Curb may be regarded as being an hereditary unsoundness in light horses and ponies only; (*b*) curb is the most common form of hereditary unsoundness in ponies; (*c*) curb is rare in draught horses and negligible as a form of hereditary unsoundness.

(5) As regards *Bog Spavin*, *Thoroughpin*, *Cataract*, and *Roaring*, the figures are insufficient for any reliable conclusions to be drawn.

Age-period of Development of Unsoundness.

No horses under two years old have been examined. Next to aged horses (six years and over) the age at which the greatest number has been submitted is three years. The excess of three-year-olds over four- and five-year-olds, is accounted for by the fact that during the second and third years there was the influx of an additional crop of colts of this age entering on a stallion career. The figures in some cases (*e.g.* ponies), and as regards the more uncommon unsoundness, are scarcely sufficient from which to generalize as to the age-period of development of unsoundness. As regards the more common unsoundness, however, it will be seen from the tables given below, that the percentage proportion of unsoundness is least in two- and three-year-olds and increases each year until the age of maturity, at which age-period (six years and over) the greatest percentage of unsoundness is found in all breeds. Indeed, it is quite likely that the proportion of unsoundness in aged horses is even greater than is shown in the tables, for the reason that a large number of horses past a showing age, and which were known by their owners to be unsound, have not been submitted for examination.

Evidence of Hereditary Character of Sidebone.

Amongst light horses only four (·51 per cent.), and amongst ponies none, have been found to have sidebone; so that the records as regards these classes are of no positive value in estimating the hereditary character of the unsoundness. As negative evidence, however, the fact of so infinitesimal a proportion of the light breeds being found affected is of the greatest significance, especially when it is remembered that these horses are, by the nature of their work and paces, subject in a much greater degree than draught horses to one of the alleged principal exciting causes of ossification of the lateral cartilages —viz., concussion.

No thoroughbred horse and no pony have been found affected with sidebone. The four light horses in which it has been found have all shown some signs in their type and conformation of admixture of draught blood. One notable instance of this was the imported English hackney, " X. G.," rejected for sidebone. His round nuggety conformation, broad flat feet, round bone, fetlock tuft, long curly hair growing from the coronets, and his high but laboured action all proclaimed the bar sinister of draught horse blood to such an extent as to belie his published pedigree. Another of these sidebone light horses, " M. G.," although having " light " characteristics at the time of examination, has been found, according to his breeding, to be actually a draught horse.

By the time the first hundred or so of draught horses had been examined, it appeared evident that valuable information concerning the transmission from sire to son of a predisposition to the formation of sidebone could be obtained. To that end I determined that the pedigrees and relationship of the different horses examined should be ascertained at the time of examination. This has been done, and as

The tables referred to are as follows:—

Table V.—Age-period of Unsoundnesses in Draught Horses.

Unsoundness	2 years				3 years				4 years				5 years				6 years and over				Totals			
	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.
	58	40	18	31·08	454	365	89	19·60	208	139	64	31·52	135	86	49	36·28	449	245	204	45·48	1,299	875	424	32·63
Sidebones.. ..	..	..	3	5·17	..	.	52	11·45	..	..	37	18·23	..	..	27	20·00	..	..	143	31·84	..	..	262	20·22
Ringbones ..	..	..	..	..	..	..	4	·88	..	..	5	2·46	..	..	4	2·07	..	..	27	6·03	..	..	40	3·05
Spavin	..	..	..	..	..	..	2	·44	..	..	..	..	..	..	3	2·22	..	..	2	·44	..	..	7	·53
Bog spavin, &c. ..	..	..	..	..		..	6	1·32	..	..	4	1·97	..	..	1	·74	..	..	6	1·33	..	..	17	1·29
Totals ..	58	..	3	5·17	454	..	64	14·09	208	..	46	22·66	135	..	35	25·93	449	..	178	39·64	1,299	..	326	25·09

Table VI.—Age-period of Unsoundnesses in Light Horses.

Unsoundness	2 years				3 years				4 years				5 years				6 years and over				Totals			
	Exd.	C.	N.C.	Rejects per cent.	Exd.	C.	N.C.	Rejects per cent.	Exd.	C.	N.C.	Rejects per cent.	Exd.	C.	N.C.	Rejects per cent.	Exd.	C.	N.C.	Rejects per cent.	Exd.	C.	N.C.	Rejects per cent.
	22	17	5	22·7	130	101	29	22·8	102	83	19	18·5	80	68	12	15·0	445	362	83	18·65	779	631	148	18·99
Sidebones.. ..	..	..	..	..	..	..	1	·76	..	..	.	..	..	..	..	..	..	..	3	·67	..	..	4	·51
Ringbones ..	..	..	..	..	..	..	1	·76	..	..	1	·98	..	..	..	..	..	..	12	2·68	..	..	14	1·79
Spavin	..	..	..	..	..	..	3	2·30	..	..	2	1·96	..	..	2	2·50	..	..	18	4·02	..	..	25	3·61
Bog spavin, &c. ..	..	..	..	..	..	..	1	·76	..	..	1	·98	..	..	2	2·50	..	..	4	·90	..	..	8	1·08
Curb	..	..	4	18·18	..	..	5	8·86	..	..	3	2·94	..	..	1	1·25	..	..	6	1·86	..	..	19	2·44
Roarer	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	·45	..	..	2	·26
Totals ..	22	..	4	18·18	130	..	11	8·44	102	.	7	6·86	80	..	5	6·25	445	..	45	10·08	779	..	72	9·24

TABLE VII.—AGE-PERIOD OF UNSOUNDNESSES IN PONIES.

Unsoundness	2 years				3 years				4 years				5 years				6 years and over				Totals			
	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.
	18	10	8	44·44	102	73	29	28·48	79	61	18	22·78	70	60	10	14·28	289	244	45	15·57	558	448	110	19·71
Ringbones ..	..	..	..	..	..	..	1	·98	..	.	..	..	..	.	1	1·48	.	..	4	1·40	..	..	6	1·08
Curb ..	..	..	..	..	..	..	1	·98	..	..	3	3·79	..		3	4·28	.	..	1	1·04	..	..	10	1·79
Spavin ..	..	..	..	..	.	..	.	.	..	..		.		..	..	.	..	..	2	·71	..	..	2	·36
Bog Spavin ..	..	..	..	..	..	..	..	.	..	..	.		..	..	..	..	..	..	.	..	..	..	..	..
Cataract ..	..	..	..	..	..	.	1	·98	.		.	.	.	..	.	..	..	.	.	..	..	..	1	·18
Total ..	18	..	..	..	102	..	3	2·94	79	..	3	3·79	70	.	4	5·71	289	..	9	3·15	558	..	19	3·41

TABLE VIII.—AGE PERIOD OF UNSOUNDNESSES IN ALL BREEDS (DRAUGHT HORSES, LIGHT HORSES AND PONIES).

Unsoundness	2 years				3 years				4 years				5 years				6 years and over				Totals			
	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.	Exd.	C.	N.C.	Per cent. N.C.
	98	67	31	31·63	636	539	137	19·99	384	283	101	25·80	285	214	71	24·91	1,183	851	332	28·07	2,636	1 955	682	25·87
Sidebones ..	..	..	3	3·06	..	..	54	7·87	..	.	37	9·63		..	27	9·48	.	..	146	12·35	..	.	267	10·09
Ringbones ..	..	..	..	..	.	..	5	·74	..	..	6	1·52	.	.	5	1·75	..	..	43	3·63	..	..	60	2·28
Spavin	..	..	..	..	.	..	5	·74	..	.	2	·52	..	..	5	1·75	.	.	22	1·85	..	..	34	1·29
Bog Spavin ..	..	..	..	..	..	..	7	1·01	..	.	5	1·21	..	..	3	1·05	..	..	10	·85	..	..	25	·94
Curb	..	..	4	4·08	..	..	6	·87	..	..	6	1·56	.	.	4	1·40	..	..	9	·76	..	..	29	1·10
Cataract (Eye) ..	..	..	..	..	..	..	1	·14	..	..	..	..	..	..	.	..	..	..	..	..	..	..	..	1·04
Roarer	..	..	..	..	..	..	..	..	..	..	..	.	..	..	..	..	..	..	2	·16	..	..	2	·08
Total ..	98	..	7	7·14	686	.	78	11·37	384	.	56	14·58	285	..	44	15·43	1,183	..	232	19·61	2,636	..	417	15·82

a result I am able to present a series of tables of family groups of horses examined—some families in which there is a great preponderance of sidebone in the progeny, and some the members of which are virtually all sound.

In perusing the tables of sideboned families, attention should be given to the ratio of sideboned to sound progeny. Such ratio in each case, when compared with the general percentage (20·17) of sideboned horses, as shown in the previous tables, will be found to be greatly in excess. Similarly, in the case of the sound families, only those have been tabulated in which the percentage of sound animals greatly exceeds the general percentage.

For the reason already mentioned—viz., that the influence of the dam in any given case cannot be calculated—the deductions to be drawn from these tables are not as exact as is desirable, but there is one family (*see* Table IX., Family "A") in which it would appear that when the horse was mated with mares belonging to a sidebone sire family, the offspring developed sidebones, but when mated with outside mares the offspring remained sound. Seven sons of this sire, "T. I.," have been examined. Three of these—viz., "C. M.," "I. M.," and "I. Q.," were ex-. "Q. of B." mares, and all of them were rejected for sidebone. The other four were ex-mares of sound sire blood, and were found sound.

Note.—(1) In the tables following, for obvious reasons, the actual names of the horses are not given. The names are indicated by the use of a cipher consisting of initial letters bearing a similar relationship in all cases to the actual names of the horses concerned. A duplicate series of tables containing the actual names, together with the cipher key, has been furnished to the Melbourne University examiners, the Minister for Agriculture, and the Editor of this journal.)

TABLE IX.—UNSOUND FAMILIES.*

Family "A."—Sire, Q. of B. (not examined).

Sideboned 24 (9 sons, 15 grandsons). Sound 15 (2 sons, 13 grandsons).

Remarks.—61·5 per cent. of examined progeny sideboned; 38·5 per cent. sound.
81.8 per cent. sons sideboned; 18·8 per cent. sound.
53·5 per cent. grandsons sideboned; 46·5 per cent. sound.

The influence of sound blood on the dam's side in the case of the grandsons may be presumed, each grandson only carrying one-quarter of "Q. of B." blood against three-quarters outside blood. This family is an instance of what has been observed throughout, viz., that the influence of the foundation sire, whether in the direction of soundness or unsoundness, lessens with each generation, unless there is introduction of sound or of unsound blood, as the case may be, on the dam's side in the younger generations.

Family "B."—Sire, T. Q. (not examined).

Sideboned 15 (8 sons, 7 grandsons). Sound 10 (4 sons, 6 grandsons).

Remarks.—60 per cent. of examined progeny sideboned; 40 per cent. sound.
66·7 per cent. sons sideboned; 33·3 per cent. sound.
53·7 per cent. grandsons sideboned; 46·3 per cent. sound.

Family "C."—Sire, Z. D. I. (not examined).

Sideboned 5 (4 sons, 1 grandson). Sound 1 (a grandson).

* Owing to want of space, these tables, which were set out in detail in the original, have had to be summarized.—EDS. *V. J.*

Family "D."—Sire, O. C. (not examined).

Sideboned 4 (3 sons, 1 grandson). Sound 1 (a son).

Family "E."—Sire, D. of the O." (not examined).

Sideboned 4 (3 grandsons, 1 great-grandson). Sound (*nil*).

Family "F."—Sire, U. D. (examined—sideboned).

Sideboned 3 (all sons). Sound (*nil*).

TABLE X.—SOUND FAMILIES.

Family "A."—Sire, T. M. (not examined).

Sound 35 (19 sons, 15 grandsons, 1 great grandson) Sideboned 7 (1 son, 6 grandsons).

Remarks.—83·3 per cent. of progeny sound; 16·7 sideboned.
95 per cent. of sons sound; 5 per cent. sideboned.
72·7 per cent. of grandsons and great grandsons sound; 27 per cent. sideboned.

Clearly the increase in number of sideboned grandsons over sons is due to the introduction of sidebone blood through the dams, especially seeing the preponderance of aged sound horses amongst the sons.

Family "B."—Sire, C. Q. (not examined).

Sound 30 (2 sons, 13 grandsons, 15 great grandsons). Sideboned 1 (a grandson).

Remarks.—The quality of soundness must have been particularly "dominant" in this sire, for it is not likely that 30 of the 31 dams of his stallion progeny were free from sidebones. The grandson, "Q. of O.," himself sound, is the sire of ten of the sound great grandsons.

Family "C."—Sire, M. E. (examined—sound).

Sound 19 (all sons). Sideboned 1 (a son).

Remarks.—It is regrettable that the pedigree of "H" (the sideboned son) on dam's side cannot be traced. She must belong to a pronouncedly sideboned family, seeing that her colt had well-developed sidebones at two years old, although got by sire whose every other son kept as a stallion is sound.

Family "D"—Sire, T. X. (not examined).

Sound 12 (all sons).

Family "E."—Sire, D. the T. (not examined).

Sound 11 (8 sons, 3 grandsons). Sideboned 1 (a grandson).

Family "F."—Sire, L. of L. (not examined).

Sound 10 (all grandsons). Sideboned *nil*.

Family "G."—Sire, J. I. (not examined).

Sound 10 (all sons). Sideboned 2 (both sons).

Remarks.—This may not turn out to be a particularly sound family. The percentage of sideboned sons is already 16·7, and amongst the sound sons there is a heavy proportion of two and three year olds, some of which may develop sidebones later on.

Family "H."—Sire, B. (not examined).

Sound 8 (7 sons, 1 grandson). Sideboned *nil*.

Family "I."—Sire, Q. S. (not examined).

Sound 7 (6 grandsons, 1 great grandson). Sideboned *nil*.

Family "J."—Sire, D. of the T. (not examined).

Sound 4 (all sons). Sideboned *nil*.

Location of Sidebone as Evidence of Hereditary Character.

Concerning the frequency of occurrence of sidebone on the inside or outside of the foot, and as to which feet are more frequently affected, the following synopsis as regards the 275 sideboned horses is informative :—

Firstly, as to the number of feet affected—

	40 horses had sidebone		1 foot only
	214 ,,	,,	2 feet only
	8 ,,	,,	3 ,,
	13 ,,	,,	4 feet
Total ...	275 affected with sidebone.		

Secondly, as to relative frequency in front and behind—

	254 horses had sidebones		in front only
	2 ,,	,,	behind only
	19 ,,	,,	both in front and behind

Total ... 275, of which 273 had sidebone in front and 21 had sidebones behind—a proportion of 13 horses affected in front to each 1 behind.

Thirdly, as to the relative frequency of near side and off side affection—

Of the above-mentioned 254 horses having sidebone in front—

	197 horses had sidebones		both fore	= 394 feet affected
	16 ,,	,,	near fore only	= 16 ,, ,,
	41 ,,	,,	off fore only	= 41 ,, ,,
Total ...	254			451

Of these 451 affected feet, 213 were near fore and 238 off fore, viz. :—$197 + 16 = 213$ near fore, and $197 + 41 = 238$ off fore.

Fourthly, as to the relative frequency of sidebone on the inside and outside of the foot—

Of the above-mentioned 254 horses having sidebone in front only—

147 had 4 sidebones	(588 individual sidebones)—	294 inside	and	249 outside
32 ,, 3 ,,	(96 ,, ,,)	36 ,,	,,	60 ,,
46 ,, 2 ,,	(92 ,, ,,)	24 ,,	,,	68 ,,
29 ,, 1 ,,	(29 ,, ,,)	9 ,,	,,	20 ,,
254 horses sidebone in front	(805 ,, ,,)	363 (45·1 %)	,,	422 (54·9 %) outside

(a proportion of 9 inside to 11 outside).

Of the 46 horses shown in this table as having two sidebones in front, 28 were affected on one foot only; the remaining 18 had one sidebone on each foot, making 36 sidebones in all (18 × 8). Of these, 6 were inside and 30 outside. Therefore, the number of horses having sidebones on both feet was 197 ($18 + 32 + 147$). These 197 horses had 720 individual sidebones between them ($588 + 96 + 36$), distributed as follows :—

720 sidebones ... { 384 outside (53·3 per cent.).
336 inside (46·7 ,,).

48 more sidebones on outside than inside—a proportion of 8 (outside) to 7 (inside).

The outstanding features of the above figures are :—

(*a*) The great excess of sidebones in the fore-foot as compared with the hind—proportion 13 to 1.

(*b*) The preponderance of cases in which both fore were affected as against one-foot affection—proportion 10 to 3.

(*c*) The approximation of the incidence of sidebone in the near and off foot—proportion 9 to 10.

(*d*) The approximation of the incidence of sidebone on the inside and outside of the foot respectively—proportion 9 to 11, inclusive of single-footed sidebones; 7 to 8 for pair-foot sidebones only.

Concerning (*a*) it is reasonable to regard the excess of sidebones in front as positive evidence of the part played by concussion and strain of body weight as exciting causes of sidebone. More weight is borne during rest and greater concussion is sustained during movement by the fore limbs and feet than the hind limbs and feet, for two reasons: *Firstly*, the incidence of body weight on the fore feet is greater than on the hind; *secondly*, the column of bones of the fore limbs, being practically perpendicular from the elbow down, is more rigid than that of the hind limb, in which the angle formed by the tibio-metatarsal bones tends to lessen jar.

The effect of concussion in the production of splints might be adduced in support of the above conclusion. It is definitely recognized that the greatest exciting cause of "splints" in light horses is concussion. Their occurrence in the metacarpal region is, as compared with the metatarsal, in about the same proportion as recorded above concerning sidebones in the fore and hind feet respectively of draught horses. Incidentally, it may be mentioned that the form of hoof in which sidebone has been most frequently found, is that in which the wall—particularly at the sides—approaches the perpendicular. Such feet are also usually small, narrow, and blocky. Sidebones are seldom associated with large and spreading or broad and flat feet.

As regards (*b*) the fact of the sidebone occurring in both fore feet more than three times as frequently as in a single foot, indicates an intrinsic causation rather than causation by external violence, which would scarcely happen to both fore feet simultaneously.

Comment on (*c*) may be confined to the statement that the excess of sidebones found in the off feet, as compared with the near, is so slight (10 to 9) that it cannot be regarded as of any significance in the matter of determining the causation of sidebone. The observation, however, conflicts with the statement in Mollar and Dollar's *Veterinary Surgery*, that "the cartilage of the left foot suffers more frequently than that of the right."

Observation (*d*) is of considerable importance. The fact that the disparity between the incidence of sidebone on the outside and inside of the foot is so slight (only as 8 is to 7) would appear to indicate the falsity of a commonly held supposition, viz., that sidebone is regularly caused by an injury sustained through the dropping of the shafts on to the coronets when the horse is being unyoked from a dray, or from the coronets being trod on when working in a team. In the former case it is obvious that only the outside coronets could sustain injury, but in neither case can such a cause be admitted as regards the horses under review. Being stud horses and many of them of high value, it may be asserted that not one in ten of the draught horses examined had even been yoked to a dray or harnessed in a team, or even worn a collar.

On this theory of injury as a cause of sidebone, it may be remarked that the number of occasions with any evidence of external injury

having been sustained, such as a scar, is practically negligible; on the other hand, some of the draught sires and many of the trotting sires examined have shown scars over the seat of sidebone, but without any ossification of the cartilage having occurred. This was notably the case with the pony "D. S.," whose near fore coronet outside had apparently at one time been literally cut to pieces, yet without even stiffening the cartilage. In cases of quittor it frequently happens that the inflammatory process involves the lateral cartilage to the extent that suppurating sinuses may pierce it, and the cartilage still remains free from ossification. I doubt whether sidebone is ever caused by external violence *per se*, and I do not think that even deliberate bruising of the coronets of a light horse by severe hammering would result in ossification of the underlying cartilage. Amongst hundreds examined, I have never seen any specimen showing evidence of ossification having commenced at the summit or margins of the cartilage. It always commences at the base where the cartilage is joined to and rests on the wing of the pedal bone and gradually extends upwards throughout the substance of the cartilage to the summit and borders. Many specimens are in my possession showing all stages of growth of sidebone from the very commencement at the base of the cartilage, through gradations in size of the ossified portion to the fully-formed sidebone involving the whole of the cartilage. I have never been able to find a specimen of bony formation at the top of the cartilage with normal cartilage in between the summit and base. I have one specimen in which the sidebone had become detached from the wing of the *os pedis* and formed a false joint, but the indications on the bones are that a fracture had occurred subsequent to the development of the sidebone, and not that the ossification had commenced high up in the cartilage and extended downwards with failure to unite with the basilar process of the wing of the *os pedis*.

It, doubtless, is the case that many draught horses when worked in pairs or in teams abreast are trodden on at the seat of the sidebone, and that some of such horses may subsequently develop sidebones. Many so trodden on, however, do not develop sidebones, and the logical inference is that when sidebones develop after actual or supposed injury, they develop despite the injury, and not because of it. In such cases sidebones would doubtless have formed whether injury had occurred or not; but where injury has occurred and sidebones have been noticed afterwards, the injury is credited with being the cause, although the sidebone may have been present, but unnoticed, at the time the injury was sustained.

Since the attention of horse-owners has been so pointedly called to the subject of sidebones by the results of the Government examination of stallions, many of them have given me instances within their own experiences on their own farms which corroborate the conclusions above set out—cases in which certain horses on the farm related to one another have all developed sidebones, but the remaining horses on the farm, worked and treated in exactly similar fashion, but unrelated to the sideboned horses, have remained sound. Mr. K. C., of Y., has five descendants of one mare, all bred on his farm and all sideboned, while seven other home-bred horses, unrelated to the mare in question, but which have been reared and worked under the same conditions as her descendants, have remained sound.

WORK VERSUS HEREDITY IN THE PRODUCTION OF SIDEBONES.

The only set of figures bearing on the incidence of sidebone which I have come across in any veterinary text-book are those by Lungwitz, quoted in Mollar and Dollar's "Veterinary Surgery." Lungwitz examined 1,251 horses, and furnished the following table of results :—

Description	Number of Horses Examined	Number affected with Sidebone	Percentage	Remarks
Belgian cart horses	98	68	69·5	Working only on hard pavements
Danish carriage horses ...	120	25	31	,, ,, ,,
Heavy riding horses	388	36	9	Working on heavy ground and partly on hard pavements
Heavy riding horses	132	—	—	Working on light sandy soil
Light riding horses	133	8	6	Working on light ground
Riding horses (various weights)	140	3	2	Working on light ground
Military horses	200	1	0·5	Working on medium heavy ground
Officers' horses (heavy) ...	40	3	7·5	Working on varied surfaces
	1,251	144	14·4	

The figures in this table relate to working horses only, not to stud horses, and do not throw any light on the question of hereditary influence in the occurrence of sidebone. They support the conclusion set out above as to sidebone being essentially an affection of draught horses, but one false inference may be drawn from the figures—viz., that the development of sidebone is consequential on the character of the work performed by the horse. Rather is it that the horses which are used for draught work on hard pavements and heavy ground are of the class that are hereditarily predisposed to the development of sidebones. In support of this latter view the fact must needs be mentioned that all the horses dealt with under the Victorian Government scheme were stud horses. Few of them had done any kind of work, and practically none had worked on pavement. The roads travelled by stallions when doing their season have an earth surface frequently cushioned with dust or grass; in the vicinity of the larger towns only are the country roads metalled or macadamized.

Another interesting fact as bearing on the falsity of the view that sidebones are caused by the use of calkin or high-heeled shoes, is that practically all the draught horses examined were shod without heels, the practice of shoeing stallions with flat shoes being general throughout this country.

EVIDENCE OF HEREDITARY CHARACTER OF OTHER UNSOUNDNESSES.

Table IV. shows the total number of rejections for ringbone, bone spavin, curb and bog spavin to have been respectively 60, 34, 29, and 25, as against 275 cases of sidebone. The difficulty, therefore, of revealing evidence of hereditary transmission of these other unsoundnesses as compared with sidebone is in ratio to the lesser numbers available for analysis in each case. There is only practically one-fifth

of the number of the cases to work on in the case of ringbone, one-ninth in the case of bone spavin and curb, and one-eleventh in the case of bog spavin.

Nevertheless, relationship between a varying number of horses found to have these unsoundnesses respectively may be cited.

RINGBONE.—Of the forty draught horses rejected for ringbone, five belong to one family and four to another.

The five comprise four sons, and one g.-g. son of the sire Q. of B. In the other family the four rejects for ringbone are grandsons through their dams of the sire B.

BONE SPAVIN.—Relationship between the horses rejected for bone spavin has not, up to the present, been found to exist sufficiently close as to warrant the submission of any instances as evidence of hereditary influence as the causation of this particular unsoundness.

CURB.—In regard to curb, seven families have been encountered in which near relatives have been found affected. Particulars of these are :—

Family 1.—Sire and one son examined both having curbs.

Family 2.—Three sons having curbs (sire not examined).

Families 3 *and* 4.—Both sires sound; two sons curbed in each case.

Families 5 *and* 6.—Sires not examined; in each case two sons with curb.

Family 7.—One son and one grandsire with curb (sire not examined).

Bog Spavin.—In one sense, the evidence of hereditary influence in the causation of bog spavin (including thoroughpin) is more pronounced than in respect of sidebone. There are no less than nine families in which a varying number of descendants have been affected with bog spavin.

[The horses referred to have not necessarily been rejected on account of this particular unsoundness—bog spavin.]

In the case of *Family* 1, five sons have had bog spavin.

In *Family* 2 three sons had bog spavin.

In *Family* 3 three sons had bog spavin, and two other sons examined were sound.

In *Family* 4 two sons and one grandson had bog spavin.

In three other cases (*Families* 5, 6 and 7) two sons of the same sire had bog spavin.

In one case (*Family* 8) a sire and son have been examined and rejected for bog spavin.

In one case (*Family* 9) a son and grandson of one sire have been rejected for bog spavin.

Review.

A TEXT-BOOK OF VETERINARY ANATOMY. By Septimus Sisson, S.B., V.S., Professor of Comparative Anatomy in the Ohio State University, Columbus. Octavo, pp. 826, with 588 illustrations. Cloth. Price 30s. net. Published by Messrs. W. B. Saunders and Co., Philadelphia and London, 1910.

It is a long time since any work on systematic veterinary anatomy has been published in the English language, and during that time great strides have been made, and many changes have taken place, both in the methods of preparing subjects and in nomenclature. As a result of the former, specimens having been frozen or hardened by injection of formalin, our knowledge of reviews concerning the natural shape of many viscera has been modified.

The change of nomenclature is of very great importance. Up to the present practically all the text-books in the English language have adopted different systems. The author of the volume under consideration has decided to adopt the terms agreed upon by the congresses of anatomists at Baden and Stuttgart, a very commendable step, since it will tend to minimize confusion of terms, for the same system is likely to be adopted by comparative anatomists throughout the world. The author, however, considers it wise to adopt the change gradually, and has made some concessions, and while adopting the new names in many places, he retains many of the old ones, giving the new ones in parentheses. There is probably much to be said in favour of this view, but we think it would probably have been better to have made the change complete at once, giving the old names in parentheses. The change will undoubtedly cause some confusion to clinicians for a time, as, for example, in reference to the "Flexor metatarsi" muscle. This name can no longer be found in the index, the muscle being regarded more correctly as two muscles, the tendinous portion being called the "Peroneus tertius," and the muscular portion the "Tibialis anterior." Another example is the complete change in the names of the bones of the carpus and tissues, names much more reasonable, but at first likely to cause confusion. We would suggest an addition to the next edition of tables of synonyms which could be easily referred to, and in that case no transitional stage of nomenclature would be necessary.

The various descriptions are very lucid, and easily followed, and the illustrations, many of them in colour, are excellent, and will be found of the greatest possible assistance to both anatomists and clinicians. Many of the illustrations are original, but a very large proportion are taken (with full acknowledgments) from the excellent German works of Ellenberger and Baum and Schmaltz. The work also includes useful tables of dentition for all the domesticated animals.

The type, binding, and finish of the book are worthy of what is likely to become a standard work. It should be obtained by all students and practitioners.

Translations.

JOINT AFFECTIONS FOLLOWING STRANGLES.

By Chief Veterinary Surgeon BREITENREITER.

The service horse Canaille of the 3rd squadron of Hussars fell ill with strangles on October 26, 1909. There was loss of appetite, dry cough, nasal discharge, swelling of the maxillary glands, and later abscess formation. A week later fever was present: the highest temperature registering 39·7° C. After fourteen days nasal discharge and cough ceased; appetite returned, and the horse was considered convalescent. Suddenly on November 25 food was refused, and the horse stood listlessly in his stall; when put over he moved stiffly and with pain. Examination showed hot, painful swellings of the left fore fetlock and both hock joints. Rectal temperature was 39° C. Fever and loss of appetite continued five days and afterwards passed away; at the same time the swelling of the fore limb disappeared, whilst those on the hock joints kept reappearing now on the right and again on the left articulation. The joint affection was accompanied each time with fever, loss of appetite and severe lameness. In the middle of January, 1910, the joint trouble ceased; it did not recur again, and the horse was discharged cured at the end of February, although there was slight thickening of both hock joints which has not disappeared even to-day. Lameness or illness have not since been noticed. Treatment consisted in camphor spirit bandages and inunction of of ichthyol ointment. Internally salicylate of soda was given; any special effect from these agents could not, however, be established with certainty.

(*Zeitschrift für Veterinärkunde.*)

THE ACTUAL RESULTS OF IMMUNIZATION AGAINST HOG CHOLERA OR SWINE FEVER.

By Professors HUTYRA and WETZL.

The experiences with immunization against hog cholera having given some favourable results, the procedure has been introduced into practice.

The immunizing serum is produced in a special establishment. Some pigs having resisted natural or accidental infection from the plague, receive in one injection under the skin 1,000 to 1,200 c.c. of virulent blood, or on two occasions 500 to 600 c.c., in a space of two to four weeks. These hyperimmunized animals are bled at the tail after three or four weeks; a week later they are sacrificed by being bled to death. At first the blood was defibrinated and mixed with carbolized water, but recently it has been found that the serum of treated animals answers quite as well.

One injects 7½ c.c. of serum for pigs of less than 20 kilogrammes (44 lb.), 10 c.c. for those that weigh 20 to 40 kilogrammes, and 15 c.c. for animals weighing more than 40 kilogrammes. The action of the serum has been proved in 106 experiments.

In seventy-one piggeries, having contained 7,609 infected animals, the swine appearing healthy were inoculated with a mortality rate of only 1·7 per cent. In forty-two of these piggeries 3,125 inoculated pigs furnished no case of the complaint. The mortality was 15·7 per cent. for fourteen other standings (1,611 inoculated), 23·7 per cent. in five (253 inoculated), 36·4 per cent. in eight (603 inoculated); in these same experiments animals not inoculated furnished respectively a mortality rate of 44·8, 47·2 and 59·4 per cent.

From these results it is shown that effects are most favourable in places where the disease is of an attenuated character.

In eight herds inoculation remained without result, the mortality cypher being about the same for the inoculated and non-inoculated (59·9 and 57·9 per cent). In one of these piggeries the plague was complicated with an outbreak of erysipelas; in four others intestinal lesions were completely absent at the autopsy, and there was a prevalent septicæmia without a doubt.

The results are much less favourable after inoculation of ailing swine, although the inoculated furnish a lower mortality rate than those not treated. It is very probable that inoculation only takes effect at the commencement of the plague when no secondary infection has been produced.

(*Allatorvosi Lapok.*)

THE ACTUAL STATE OF OUR KNOWLEDGE ON THE *ROLE* OF FLIES IN THE DISSEMINATION OF PARASITIC MALADIES AND ON THE MEANS EMPLOYED AGAINST THEM.

By B. GALLI-VALERIO,

THE harmful *rôle* of *Muscidæ* is clearly established to-day. In the larval state flies can adapt themselves to live on and in the animal body, provoking cutaneous myases, nasal, buccal, auricular, intestinal, vesical. In the adult state they act in a direct fashion by the irritation which they provoke, or in an indirect fashion by conveying animal or vegetable parasites which they deposit on the skin or mucosa of animals, and above all in food and drink. Flies can even explain the existence or reappearance of an illness, if one refers to the works of Cao, who proved that germs ingested by the larvæ can be found again inherent to the excrement or eggs of perfect insects.

We will confine this general *exposé* to facts pointing to the transmission of animal parasites. Cobbold was of opinion that flies could convey the eggs of *Fasciola hepatica* and spread them in water. Grassi found the eggs of *Tænia solium* and *Trichocephalus trichiurus* in the intestine of flies which had drunk water soiled by these parasites.

Flies have been accused of transmitting tracheoma, frambœsia, and variola; these facts are still discussed.

From different trials experimenters have recovered tubercle bacilli from the intestines of flies captured in the rooms of the tuberculous; all have published positive results and generally in an increased proportion (Spilmann and Haushalter, Hoffmann, Alessi), Galli-Valerio

only reports old researches; the most recent are 1888, and the authors have perhaps confounded acido-resistant bacilli with tubercle bacilli.

The *rôle* of flies in the transmission of anthrax has long occupied attention. It is not doubtful that it is possible to refind the bacterides on the bodies or in the intestines of flies which have been in contact with contaminated products, but their *rôle* as a vehicle of contagion ought to be well restrained. In the dissemination of cholera, typhoid fever, and dysentery, flies play an important *rôle;* food, notably milk, can be contaminated by flies that have been in contact with virulent fæcal matter. Joly considered that glanders in Guadaloupe was spread by flies, Jäger that symptomatic anthrax is so spread. Chloride of lime on the dungheaps (which are the homes of flies), even in thin layers, produces good results.

(*Revue Générale de Médecine Vétérinaire.*)

Books and Periodicals, &c., Received.

Encyclopædia of Sport (Heinemann), Parts IX. and X.; The Gulf States Farmer (Louisiana); The American Journal of Veterinary Medicine; Proceedings of the Royal Society of Medicine; Bulletin of the Bureau of Sleeping Sickness; Agricultural Journal of the Cape of Good Hope; Journal of Department of Agriculture of Victoria.

Letters and Communications, &c.

Mr. E. Wallis Hoare; Captain A. J. Williams; Mr. E. D. Martin; Mr. W. Freeman Barrett; Mr. F. Chambers; Mr. J. Peddie; Secretary of the Glasgow Veterinary College, Incorporated; Mr. W. H. Dalrymple; Board of Agriculture and Fisheries; Department of Agriculture and Technical Instruction for Ireland.

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INDEX.

A

B

C

D